Architects' Edition

THE CANADIAN ARCHITECT AND BUILDER

Vol. XX.—No. 8. Toronto, Montreal—AUGUST, 1907—Winnipeg, Vancouver PRICE 25 CENTS $2.00 PER YEAR.

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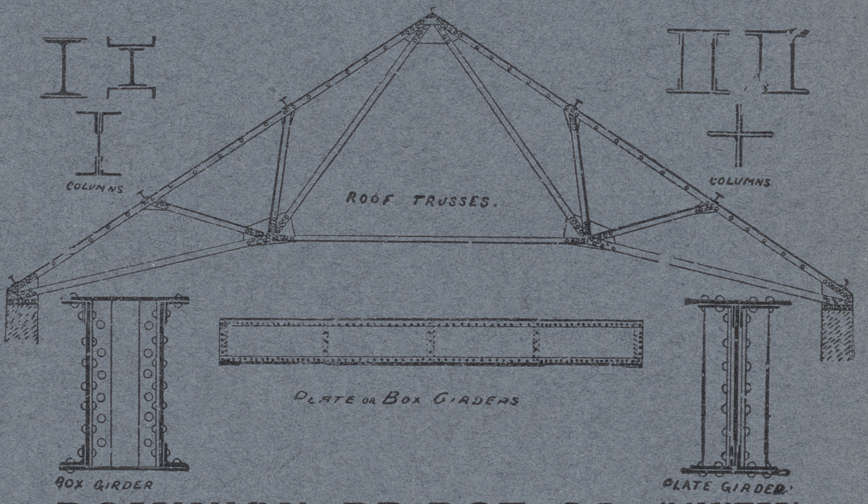

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INDEX TO ADVERTISEMENTS

SASKATCHEWAN'S WATER SUPPLY.

The Executive Council of the Province of Saskatchewan has had under consideration a report from the Commissioner of Public Works, stating that in many parts of the province serious inconvenience and hardship exists resulting from the inability of settlers to secure a water supply, and that in many instances these conditions are due to the absence of suitable well machinery. The Minister also reports that in order to assist in the solution of this difficulty it is desirable to encourage the importation of well machines adapted to the requirements of particular districts, and that it is also desirable to encourage the sinking of wells by paying a portion of the cost thereof.

Upon the recommendation of the Commissioner of Public Works the Executive Council advises:

1. That upon receipt of a petition, signed by at least three residents in an area where unsuccessful efforts have been made to secure a water supply, which area shall not exceed thirty-six square miles, and upon the conditions that the owner of a well machine will agree (a) to sink at least three wells in the area defined, each well to obtained a supply of water, or, if no water is obtained, each well to be sunk at least 300 feet deep and furnish satisfactory evidence of same; (b) to supply satisfactory evidence as to cost of machine, power and tools laid down at destination; (c) not to remove machine from this area nor to dispose of it to a second party without the permission of the Commissioner of Public Works (d) to charge such rates for sinking well as may be approved by the Commissioner of Public Works.

There shall be paid out of any moneys appropriated by the Legislative Assembly for that purpose to the owner of each such well machine:

1. One-half the cost of the well machine, including the power, provided the machine costs $500, f.o.b. destination, but not over $2,000, and is of such style as to receive the approval of the Commissioner of Public Works.

The payment as provided under this clause is to be made upon fulfillment on the part of the owner of the aforesaid conditions, with the exception that in case satisfactory security, such as chattel mortgage, is given, that the provisions of clause (a) will be complied with; payment under this clause may be made upon registration of chattel mortgage, the said mortgage to be discharged after conditions of clause (a) are complied with.

2. A bonus of $1 per foot for every foot over 500 feet in any well, but bonus under this clause not to exceed $500.

3. If necessary to drill over 1,000 feet in depth, such further bonus as may be decided upon by the Commissioner of Public Works.

In addition to the above assistance the Department may supply well casing and any other well supplies the Commissioner of Public Works may deem advisable, at cost.

Nothing in the foregoing is to be construed as prejudicially affecting arrangements made in respect to assistance to importers of well machines, prior to the date of this Order-in-Council, and payments may be made in such cases in accordance with the arrangements already agreed upon.

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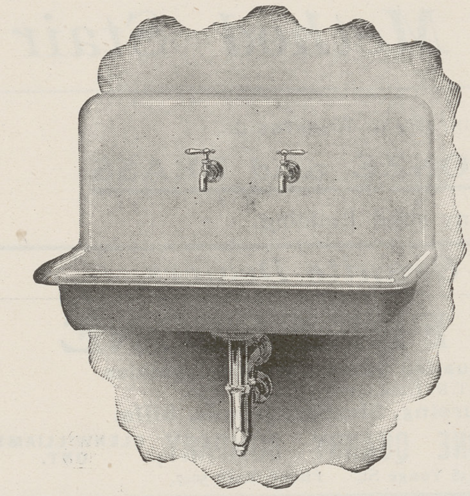

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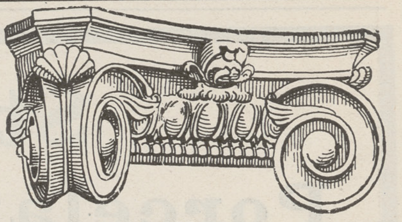

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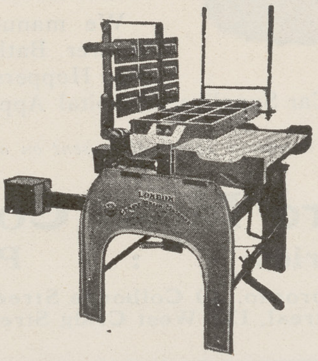

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Canadian Architect and Builder Students' Competition for a Small Suburban House.

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CONTENTS

Registration of British Architects. At a recent meeting of the Royal Institute of British Architects a revision of the charter and by-laws was made whereby there will be now admitted to the Institute a new class of members to be called "Licentiates." "The obvious intention in forming this new class of members," says the Builder's Journal, "is that it shall be a step towards the production of a Registration Bill, to be introduced into Parliament. The Institute's desire is, apparently, to bring within its fold a majority of the architects of this country, so that in approaching Parliament it can claim to represent the whole of the profession, and so defeat any opposition that may be set up by other bodies who claim, also, to represent the profession. The Institute naturally considers that its own members, who have in great part passed the examinations promoted by the Institute, or are men of undoubtedly high standing, should take a higher rank than those architects whom they now wish to bring within its scope for the purpose of subjecting these practitioners to its rules, as regards the rate of commission, professional etiquette, etc. This, of course, is all very well from the point of view of the Fellows and Associates; but it should have beeen more clearly recognized that the mere suggestion of putting a stigma upon those invited to join the new class of Licentiates would be destructive of the very purpose the Institute had in view, while some real inducement was required to make them join. The period for which admission to this Licentiate class is to remain open is one year only, as a trial. He must conform to the regulations of the Institute, but has no voice whatever in its affairs. He can neither attend the business meetings nor vote on any administrative question."

A Licentiate, moreover, must declare that he is not engaged in any other avocation than that of an architect, nor may he engage in any occupation which, in the opinion of the Council, is inconsistent with the profession of architect, under liability of suspension or expulsion. How such a system will ultimately work out will doubtless be watched with interest by Canadian architects, in view of the movement now on foot looking to the formation of a Canadian Institute of Architects.

The London Disaster. One of the most serious building collapses which has ever taken place in Canada was that of Reid's Crystal Palace, London, which occurred on July 16th. Ten persons were crushed to death and twelve injured, and only a combination of fortunate circumstances prevented a much greater list of fatalities. It seems strange that London should have been compelled to give us two such costly lessons on the necessity for precaution in structural building as have been furnished by the collapse of the City Hall floor a few years ago and again by the disaster of last month. The question naturally arises as to whether London has been unduly lax as regards carefulness in building, and some are bold enough to assert that the necessary precautions have not been carefully taken in many instances, and that many of London's public buildings are just as liable as the Reid building to furnish the world with a costly lesson on the necessity for care in structural detail.

However that may be, it may fairly be assumed that in the future much greater care will be taken to guard against a repetition of the recent disasters, not only in London, but in other Canadian cities. Moreover, there has now been clearly shown the necessity for having a building inspector constantly on the

alert for the possibilities of such catastrophes and insistent even to the point of over-scrupulousness on attention to the city's building requirements. The possibility of offending a proprietor by compelling him to submit to greater expense in his construction or comply with what at the the time may appear so much "red tape," is a mere secondary consideration when there is also taken into account the loss of human life which even a slight laxness may entail. In the present instance the legal battle, which will in all probability follow, is likely to be the greatest London has ever known, and thousands of dollars will be involved for damage suits.

So far but little light has been thrown upon the cause of the catastrophe by the preliminary investigation, and the blame has been fixed upon no one. The architect having charge of the alterations professes ignorance as to the reason for the fatality and apparently is as much in the dark as anyone, and yet it is to him that the public must ultimately look for a solution of the mystery. The contractor appears equally mystified as to the cause of the collapse. However, he took care when questioned at the investigation to make it clear that the contractor "gets his plans from the architect and goes by them" and "accepts as all right the plans of the architect." In this particular case an ordinary course of procedure was followed in making the alterations, with apparently little attention being paid to the presence on the upper floor of a heavy load from accumulating stock, and with no regard for the fact that one of the walls on which operations were being conducted was noticeably poor and unreliable. Doubtless these facts, brought to light by the inquest, have been duplicated many a time in other similar cases, but with no disastrous results, and it has remained for a serious catastrophe to call to the attention of the public the necessity for greater care being exercised by architects and builders alike in the conduct of operations wherein even a slight lack of observation may entail deplorable loss of life. The further developments of the investigation will be awaited with much interest.

Painters' Specifications.

In another part of this journal will be found the substance of an address by Mr. J. W. Knott, of Toronto, at the convention of Master House Painters and Decorators, held in London last month. In that address is voiced an ancient grievance of the master painter against the architect, Mr. Knott's treatment of which will bear some consideration at the hands of the architectural profession. As the address states, it is of the utmost importance that there should be harmony and confidence between architect and painter, a condition the importance of which the former realizes quite as much as the latter. Moreover, architects will readily admit that their specifications may leave something to be desired, so far as the rapid taking off of quantities by the painter is concerned, and a little agitation by the latter may prove effectual in remedying this trouble. As it is, much of the painter's work is to be found in the carpenter's specifications, through which he necessarily goes to learn the ground his contract must cover Now it is just possible that, through lack of a definite painter's specification, he may overlook some important part of the work which falls especially under his jurisdiction, and it probably would be to his advantage to have a definite specification drawn up, outlining the painting and finishing. To do so, however, must obviously necessitate much useless repetition which most architects would consider entirely superfluous.

As Mr. Knott correctly points out, it is a well-known fact that no contractor can so successfully deceive the architect as can the painter. If he sets out with the purpose of "doing" his employer he can usually succeed and avoid detection. However, it is a question whether this is due in any degree to the lack of a definite painter's specification. If this is the case it would surely be an act of righteousness to draw up such without delay.

The glass question, moreover, has long been a source of dispute between architect and painter, and in the course of his address Mr. Knott suggested that the architect mark on the plans some of the sizes. Now it is very questionable whether such a plan is either practicable or necessary. In the first place, the architect in planning his window openings seldom allows the standard widths of glass to influence him in the slightest degrees, and it must be from the openings themselves, as marked on the plan, that the painter estimates the quantity of glass required. Such being the case, the painter can surely rely sufficiently upon his own judgment to make no error in estimating the size of the openings and counting their number. As regards inaccuracy on the part of the draughtsman in correctly marking his openings, it may safely be assumed that any reliable architectural firm can be depended upon to draw up plans to scale with sufficient accuracy to safeguard the painter against financial loss, providing he exercises sufficient care to take his measurements correctly.

Mr. Knott no doubt speaks from experience when he says: "I have known of great loss arising from the difference in the size which the plan measured and that which had to be provided to fill the opening. In a very large sheet of plate glass an inch or two makes an enormous difference." Admitted that such is the case, but at whose door lies the fault? If a painter is careful to measure his openings—the opening in the brick, which can always be depended upon—he can have no reason for making mistakes beyond his own carelessness. It is a well-known fact that painters have been known to measure for their glass, not the distance marked on the plan between the brick wall, which is always drawn to scale, but the distance between lines put in at random later by the draughtsman to represent the frame, and which are not intended to be regarded as sufficiently correct for taking off quantities. If, by any chance, the building contractor should fail to adhere sufficiently to the architect's specifications as to modify the size of an opening to the detriment of the painter, the latter has a sufficient cause for claiming an extra. Otherwise, the fault is ordinarily his own. As conditions are in Canada today, it seems that the painter must reconcile himself to existing methods of specification,, at least until we can adopt the English system and employ a quantiy surveyor to estimate the quantities of material, not only for the painter, but for the various other contractors as well.

NOTES ON FOUNDATIONS

The base of a steel or cast iron column or a bridge bolster or shoe resting on stone or other masonry should have sufficient area in contact with the stone to prevent crushing. It should be borne in mind that generally such bases do not have an ideal bearing, so that the unit employed should be low, that is, a large factor of safety should be used. The following are good units of safe pressure to allow on various classes of masonry, in pounds per square inch: Brick masonry in lime mortar, 150; brick masonry in cement mortar, 200; ordinary rubble masonry, 200; good bridge masonry, 250; granite, 400.—Condensed from a series of articles by Edward Godfrey in "Technical Literature."

The requisites of a good foundation are: (1) The pressures per square foot on the soil must not exceed a certain safe limit. (2) The unit pressure on the entire foundation should be as near uniform as practicable. (3) The pressure should never be negative, that is, there should not be a tendency to lift the foundation which is in excess of its weight at any part. (4) The foundation must be sufficiently deep to have the underlying soil disturbed. (5) The materials must be practically indestructible in their respective places. (6) The integrity of the foundation itself must be assured; that is, it must be capable of resisting the forces upon it.

To provide for the first requisite the safe bearing power of the soil must be known. This is not determinede by experiment so much as by experience.

The pressures allowed by the New York Building Code per square foot on various soils are as follows: Soft clay, one ton; ordinary clay and sand together, in layers, wet and springy, two tons; loam, clay or fine sand, firm and dry, three tons; very firm, coarse sand, stiff gravel or hard clay, four tons. The same building code allows for tests being made to determine the bearing capacity in special cases.

In Baker's Masonry Construction the following are given as the safe bearing powers of soils in tons per square foot: Quicksand, alluvial soils, etc., 0.5 to 1; sand, clean, dry, 2 to 4; sand, compact well cemented, 4 to 6; gravel and coarse sand, well cemented, 8 to 10; clay, soft, 1 to 2; clay in thick beds, moderately dry, 2 to 4; clay, in thick, beds, always dry, 4 to 6; rock, from 5 up. This lower value is for rock equal to poor brick masonry.

In the case of hard rock the area of foundation may sometimes be determined by the strength of the foundation rather than that of the rock. Thus, if concrete is used in a pier with a bearing power of 15 tons per square foot, this sets the limit, though the rock may be capable of carrying a greater load.

Instability in a foundation, as regards the bearing power of the soil is exhibited in the sinking or settling of the superstructure. This may be the result either of compressibility of the soil or of lateral flow in it. The unit loads above given are those that will generally give a structure with little or no settlement. On soils other than rock, or solid gravel, or hardpan a little settlement is usually expected and sometimes allowed for in fixing the level of the floors.

Compressible soils may have their bearing power increased (1) by ramming, (2) by driving in short piles to compact the soil by this means, (3) by driving in piles 6 or 8 feet and then withdrawing them and filling the holes with sand, slag, gravel, or concrete, well rammed in, or the holes may be made by driving a cast iron cone 20 or 30 feet into the soil and ramming the hole full of the materials named.

The advantages of monolithic and reinforced concrete over all other forms of construction in foundations are seen in structures resting on yielding soils. The solid mass of concrete, as in a wall, tends to settle as a unit, and uniformly, even though the pressure may not be quite uniform on the entire foundation.

Lateral flow in the subsoil is especially troublesome in soils of a clayey nature or in sand that is saturated with water. Quicksand is a saturated sand that flows very freely, but many saturated sands that would not be classed as quicksands are subject to this lateral flow; and foundations upon such require the utmost care. A good precaution is to drive sheet piling just outside of the foundation, so as to retain the sand or other soil, if flowing is anticipated. This will greatly increase the bearing power.

The bearing power of gravel or other similar material may sometimes be greatly increased by the use of grout. Gravel not mixed with sand may readily be consolidated into a sort of concrete by forcing into the interstices cement grout. This has been done also where some sand was present in the gravel, by first pumping out some of the sand.

When soil is deemed too soft to support the weight of a structure, piles are sometimes driven in. These support the weight either by virtue of their penetrating to hard bottom or by friction on the surrounding soil. Where a sub-stratum of rock can be reached, the piles should be driven to the same, and driving should cease as soon as this is reached. Further hammering may broom or split the pile or cause it to fail by diagonal shear and thus destroy its usefulness.

By the New York Building Code piles intended to sustain a wall, pier, or post must be spaced not more than 36 or less than 29 inches in centres. They must be driven to a solid bearing if practicable to do so. Piles less than 20 feet in length may be 5 inches at the small end and 10 inches at the butt. Piles more than 20 feet in length must not be less than 12 inches at the butt. The maximum load allowed per pile is 20 tons.

A rule quite general in Boston is to allow a safe load of 10 tons per pile when supported by friction. Piles reaching hard stratum may be loaded to 16 tons.

Timber piles in permanent structures should only be used where always wet. The piles are usually sawed off at an even level, below low water line, and the earth is excavated around them for 2 feet or more. This is then filled with concrete and the pier footing of concrete laid upon the same.

Concrete piles have recently come into extended use. These may be made by filling up with concrete

the hole left by a pile of wood or metal. In some a sheet metal shell covering a removable wooden core is driven into the ground and then the core withdrawn and the shell filled with concrete. These are often tapered. They are generally of larger diameter than wooden piles.

Piles reinforced with steel are sometimes moulded at the site, and after setting and hardening are driven in the same manner as wooden piles.

The foundations of tall buildings in Chicago are now generally made on what might be called concrete piles. They vary from 3 to 12 feet in diameter and are sometimes 100 feet long or more, reaching down to hardpan or solid rock. The excavation is done by hand in depths of 4 to 5 feet at a time. This circular hole is sheathed with vertical lagging made of boards 2 or 3 inches thick planed radially on the edges and fitted tightly together. These are held in place by flat steel bands, segmental in shape and flanged on the ends, bolted together to form a complete circle. Then the excavation is made another 4 or 5 feet, and this is also surrounded by lagging. At the bottom, if the pile is to rest on hardpan, the well is belled out to twice the diameter. The piles are generally loaded to about 20 tons per square foot, and this would give a load of 5 tons per square foot on the hardpan. The holes or wells are filled with concrete, well tamped, which should preferably be let down in buckets, so as not to separate the ingredients and thus impair the uniformity of the concrete.

The tops of these concrete shafts are capped with grillage beams or other means of distributing the load of the column uniformly over the concrete.

The load allowed on concrete piles should not exceed 20 tons per square foot for those of large diameter. If there is any possibility of their acting as columns, as in the event of the surrounding earth being removed, the unit load should be less. Concrete is weak in columns, unless it is properly reinforced with steel. A better load on piles of small diameter is about 15 tons per square foot.

Screw piles are sometimes made use of to distribute pressure and to anchor structures such as lighthouses, signal towers, etc. They are made of a shaft of steel or cast iron and an auger-shaped blade of about one turn. They are driven in by turning either by hand or other power.

A brief description of the processes used in excavating for foundations will be in place here. The ordinary process of excavating for foundations where water is not encountered is simple and the problems are few. Apart from digging or blasting out the material and handling the same there is often the question of shoring up the sides against a cave-in. In a wide excavation in loose ground the shores should not be merely horizontal struts, but these struts should be braced together diagonally and vertically to prevent displacement.

There is a process of excavating through flowing soils known as the freezing process. It is expensive and not very much used. It consists of forcing into the soil just outside of the opening to be made refrigerating pipes, freezing the mass, excavating and then damning off the soil or building in the stone or concrete work.

There are three methods of excavating for foundations in water. One is by making a cofferdam by driving sheet piling around the space to be excavated and digging out the earth. The water is kept pumped out as the excavation proceeds. Wooden sheet piling, called Wakefield piling, consists of boards spiked and bolted together in threes, the middle one being set back to form a tongue at one side and a groove at the other. Steel sheet piling has been found to be very useful for cofferdam work. It has greater strength than wooden piling, and there is less leakage. The piles can be used repeatedly.

A second method is called open dredging. This consists in dredging out the earth in the inside of a casing, which sinks as the earth is removed. The casing forms a shell for the pier, being filled with concrete when sunk to the desired depth. The shell has a uniform outside diameter and is tapered from the inside to a cutting edge. The dredging is done by means of steam shovels, or clam shell, orange peel or other bucket dredges.

Hydraulic dredging, used in different methods of excavation, is done by means of pumps. Where loose materials are to be removed by pumping out, a jet of waater agitating the materials will cause them to be drawn up by the pump. Jets of water may be used to advantage in open dredging to loosen the soil under the cutting edge.

Concrete deposited in deep water, as in an excavation made by open dredging, is apt to have the cement washed out. To overcome this it may be dropped through a tube or a tremie in as large loads as practicable. If put into jute bags, the cement will be retained; enough cement will ooze out of the meshes to cement the pieces together. Concrete mixed extra long or even retempered concrete, if it has not stood too long, is preferable to concrete in which the cement is too freshly mixed, where it is to be deposited in water.

The other method of excavation is the pneumatic process. An airtight timber crib or caisson is made, having a space underneath large enough for men to work in, provided with a cutting edge around the periphery and supplied with air locks, etc., in the roof. This is placed in the position which the pier is to occupy and allowed to rest upon the ground. Men enter and leave through the air locks, and the excavated earth is hauled up in buckets through locks for the purpose. Air is continuously pumped in and it escapes below the cutting edge. Ordinarily this air pressure keeps the water out, but if the soil becomes dense or is clayey the air pressure can often be reduced below the hydraulic head of the cutting edge, greatly to the benefit of the workmen. In such case the water that leaks in may be removed with an injector.

As the crib sinks the pier is built on it, and when suitable bottom is reached the working chamber is filled with concrete.

In foundations for tall buildings in New York sometimes pneumatic caissons are required. These are sunk under the individual columns two or more columns in a group.

The second requisite of a good foundation, namely, a uniform unit pressure on the entire foundation, has special force in foundations on soft soil. On such

soils there will be some settlement, and if the unit pressure is greater at one point than another, settlement will be greater at that point. This condition of uniform pressure is effected by making the area in bearing on the soil in proportion to the load to be carried.

Eccentrically loaded piers resting on piles should have the centre of gravity of the system of piles coinciding with that of the load as near as practicable.

The third requisite, namely, the maintenance of a positive pressure on the soil at all parts, has special force as applied to foundations for high or narrow structures where the wind may cause tension or uplift on the windward side at the edge of the foundation, also for anchorages of cantilever or suspension bridges.

In order to have no tension on the extreme edge of a rectangle, the resultant of the vertical load and the horizontal force (as the wind load or pull of anchorage) must fall within the middle third of the base.

The fourth requisite would demand that foundations be made deep enough to be free from danger of undermining by abrasion from streams or drainage water, or by excavation for foundations of adjacent structures. They should be deep enough to rest on soil not affected by frost.

Many failures of bridges have been due to the washing away of the soil beneath the piers. Gravel beds, upon which piers often rest, could very often be cemented to advantage into one mass by the use of grout, as hereinbefore described. Often the scouring action of the stream will carry away large stones of the piers themselves. These stones lose nearly half their weight when submerged, and are hence comparatively easy to move. This is a strong argument for solid concrete piers.

A depth of 4 or 5 feet is sufficient to reach soil not affected by frost in temperate regions. This is deep enough for light foundations as for mill buildings, etc., where the soil is not made ground or fill.

The fifth requisite of a good foundation, namely, that the materials be practically indestructible in their respective places, can be assured only by using materials of known lasting qualities. Brick should not be used in sea water. Wood should be used only where it will be always under water or always exposed to air only. Cement mortar and not lime mortar should be used in wet places, as lime mortar requires a long time to harden if kept wet. Steel placed in concrete is probably better not painted, as the concrete will adhere better to the steel than to the paint and is a better medium of protection than paint.

The sixth requisite demands a foundation that is strong enough to do the work that it may be called upon to do. The forces to be resisted may be (1) a downward force due to the weight of the structure carried, (2) an upward force due to an uplift that may be exerted upon the foundation, (3) horizontal or overturning forces, (4) the upward reaction of the supporting soil.

TO KEEP TOOLS FROM RUSTING.

Take two ounces of tallow and one ounce of resin; melt together and strain, while hot. to remove the specks which are in the resin. Apply a slight coat on the tools with a brush and it will keep off the rust for any length of time.

LONDON'S BUILDING COLLAPSE.

With the collapse in London on July 17th of two important places of business, attention has been directed to a rather curious state of affairs in that city.

It appears that some alterations had been in progress on the three storey premises of W. J. Reid & Company, lately leased by Peter Smirlies, for the purpose of converting it into a bowling and billiard palace. On the east side of Hamilton & Long's building five window openings were cut in the wall on the second floor, these being 6 by 6 feet. On the floor below there were only 4 windows cut, each 5 by 5 feet, and not in positions exactly below those on the second floor. At the time of the disaster neither the casings nor frames were in position. Over each window on the second floor two lintels were placed. These were of pine, 5 by 12, projecting into the wall about 8 inches. Over the windows on the first floor lintels were also placed, but these were 4 by 12's. Above these lintels were the upper two storeys, making about 25 feet of wall. According to the contractor's statement this wall was in good condition and apparently was the last to go in the general collapse.

The centre wall between Hamilton & Long's and Reid's stores was also included in the alteration scheme, and here apparently was the source of the weakness which resulted in the disaster. This wall on the first floor was 122 feet by 26 feet, and had a line of posts running down the centre directly above a similar line of posts on the ground floor. Of these posts on the first floor 9 or 10 were removed and iron pillars substituted. Also about 52 feet of the wall was taken out and 15 inch iron girders, each about 15 feet long, were put in to support the superstructure and were themselves supported by the iron pillars. These latter were put in on the Friday preceding the Wednesday on which the accident occurred.

Asked to describe the iron pillars, Architect Murray, who drew up the plans for the alterations, stated that they were 10 feet 4 inches long and were of 3-4 inch iron pipe. From Gordon's formula Mr. Murray figured that they would support 58.26 tons, and also concluded that, according to the American formula, they would support a dead weight of 50 tons. These pillars were also shown to have been placed 15 feet apart, centre to centre, they being three in number, the two centre spaces being 15 feet and the two end spaces less. The caps for the pillars were 5 by 12's, the ends of the pillars fitting into a flange, the plate at the bottom of the pillar being bedded in cement. The girder also, it was shown, weighed 55 pounds to the foot.

The wall was 18 inches thick, the plates resting on a cement bed on the wall and the flooring on 8 by 8 joists. The iron girders, it was estimated, would carry as much as the solid wall but would not hold the building together so effectually.

Some interesting testimony was furnished by Contractor Hammett, who took a sub-contract to do the masonry work and who cut out the centre wall on the first floor. This wall, Mr. Hammett testified, was very loose and shaky, and the mortar had no bond in it. The girders were bolted end to end above the caps for the pillars and also bolted together one against the other. The pairs were fastened together well, so as

to make a complete tie. At the ends they ran back 3 feet 6 inches into the piers and were embedded in cement. The reason for the centre wall being poor was stated to be on account of inferior mortar, probably owing to its having passed through a fire some years ago.

Another point in connection with the disaster was the presence on the upper floor of Reid's building of a large quantity of crockery, no stipulation with regard to the allowable quantity of which was made by anyone during the course of the alterations. From evidence adduced at the investigation it was made clear by several witnesses that not only was the quantity of crockery stored in the Reid building of considerable dimensions, but that its weight was frequently changed by outgoing shipments and additions.

From all appearances it was a combination of these two circumstances which caused the collapse—the weak centre wall and a heavy load of crockery on the upper floors. On whom rests the responsibility is a weighty question to decide.

London has no building inspector. City Engineer Graydon is the nearest approach to such an official, and he emphatically characterized the present system in vogue in London as "rotten, simply rotten." For years Mr. Graydon claims to have been trying to get a proper by-law passed for building inspection, but so far has failed to do so. London at present has practically no building restrictions outside of those preventing the building of frame structures in a certain district. There is no inspection and only a general responsibility.

Engineer Graydon claims to have visited the collapsed building a few days before the disaster, in order to inspect a frame elevator in process of construction there, and on that occasion had remarked on the frailness of the east wall pierced by so many windows, but apparently without any action being taken.

Already a by-law governing the inspection of buildings is being prepared by a special committee of the London City Council, and applications are being received for the position of building inspector.

MONTREAL NOTES.

The indications seem to be that the amount of building in Montreal during this year is equal to that done last year, but probably not much in excess. A strike amongst the steel constructors, who are asking for 40 cents an hour, is the chief trouble in view. The weather has on the whole been favorable to building operations.

As a result of the disastrous fires which took place at McGill University there is now great activity there in preparation for reconstruction. Messrs. Brown & Vallance, architects, have been given the award in the competition for new Medical Buildings. Under Professor Nobbs' charge the new building taking the place of the former Engineering Building, which was burned down on the 5th of April, is now progressing fast and has reached the second floor level. The Architectuural department, which at the same time lost its house and home and most of its worldly goods, has been well treated by the Governors, who voted four thousand dollars towards the re-equipment of this department. Prof. Armstrong is in England looking after the interests of the department, and has purchased an excellent collection of casts to replace the architectural museum which was destroyed. The collection of photographs and other equipment is also being replaced, and it is hoped that it will be possible to open the new session in the new building under very favorable conditions.

VARIATIONS IN CITY GROWTH.

From a perusal of the building statistics available in Montreal, Toronto and Winnipeg for the current year, some idea may be had of the differences in building activity prevailing in the sections of Canada in which these three cities are situated. Although the unparalleled growth of Toronto cannot be taken as an example of what prevails in Ontario generally, it is a pretty safe indication of what is going on in a lesser degree in most of the larger building centres of the province. Despite the increasingly high prices of material, the stringency in the money market and the unfavorable spring, the value of permits issued in Toronto for the first seven months of this year totalled $10,239,330, as compared with $7,391,905 in 1906, representing an increase of about 38 per cent.

For July the number of permits issued was 538, while for the same month last year the number was 460.

In Montreal the total building permits issued, including both new structures and alterations, were, curiously enough, 1,102 this year, as compared with 1,107 up to 30th June, 1906; so that, both in value of building, as well as in the number and quantity, this year's construction for the first half is almost numerically identical with last year's.

The following comparative statement shows the cost of new buildings month by month. It must, however, be borne in mind that only about 60 per cent. of the actual value is recorded, a fact which may make Montreal's operations appear unduly small when compared with Toronto:—

	1907.	1906.	1905.
January	$ 50,450	$ 65,075	$ 27,490
February......	157,460	158,481	100,215
March	534,636	262,215	315,450
April........	1,030,866	873,440	658,001
May..........	1,870,465	855,580	963,662
June	864,266	2,343,597	396,943
	$4,508,143	$4,558,388	$2,461,761

In Winnipeg the amount and value of the building operations for the present year have been considerably less than for 1906.

Returns from the department of the building inspector at Winnipeg show that 272 permits were issued in July, covering 325 buildings, representing a total cost of $870,700. In July, 1906, there were 345 permits for 407 buildings, at a cost of $1,526,800. The building total to date, this year, is $5,225,820, as against $8,584,950 at this date last year.

The proposal to enfranchise the Montreal Street Railway to handle freight appears to be meeting with favor on all hands, the action of the Builders' Exchange having been further endorsed by other representative bodies, viz., the Board, of Trade, Canadian Manufacturers and the Chambre de Commerce.

McGILL MEDICAL BUILDING COMPETITION.

Conditions of competition for the selection of an architect for the Medical Building at McGill University were drawn up by the board of assessors, consisting of Messrs. Alex. C. Hutchison, Frank Darling, and Percy E. Nobbs, as consulting architects, and Messrs. R. B. Angus, James Ross and Chas. M. Hays, representing the Board of Governors. On the 28th of May the conditions were issued to the following architects, who were invited to send in designs: Messrs. Brown & Vallance, Finley & Spence, E. & W. S. Maxwell, Ross & Macfarlane, Robert Findlay, Marchand & Haskell, Saxe & Archibald, Hogle & Davis. All these firms deposited their plans on the 15th of July in response to the invitation. The assessors' award, recommending the scheme proposed by Messrs. Brown & Vallance, was approved by the Board of Governors on the 30th of July. The designs were placed on exhibition for a few days after the announcement of the ward. The conditions and the designs submitted present a number of points of interest.

The competition was restricted to the eight firms mentioned. Each receives an honorarium of $250 towards expenses incurred. In the case of the firm selected to carry out the work, this was increased to the usual architects' commission. No definite limit of cost was stated, but a list of accommodation, with schedule of floor areas, etc., being supplied, competitors were asked to give an estimate of cost based on a guaranteed measurement of the cubic contents of the buildings they propose. It is understood that the scheme adopted will involve an expenditure of five hundred thousand dollars. Names of competitors were sent in in sealed envelopes, to be opened after the assessors' award should be made. Eighth scale plans, elevations and sections only were called for, to be in pencil on white tracing paper, mounted on calico and delivered rolled. Tints and washes for specified purposes were admissible. Competitors were supplied with plans of site, with levels indicated. It was recommended that Montreal limestone should be employed as facing—no flank or rear walls to be of inferior materials. Competitors were free to use their own judgment in regard to architectural style.

The designs submitted show such a remarkable diversity of type as would make a consideration of them of much interest, independent of their relative merits and demerits. The reason for this is partly to be found in the nature of the site, a difficult one to deal with, by reason of its irregularity of outline and steep inclination, diagonally, from corner to corner. Streets on three sides and the University grounds on the fourth give a liberal choice of approaches, and the conditions issued by the assessors, probably purposely, leave this and similar matters to the judgment of the designer. The multifarious demands of the programme have also been a difficult problem to handle. Hence we have one design—one only, and it is the one which is recommended for adoption—which has its principal approach from the side facing the campus and the city; another has its principal entrance on University street; another towards Pine avenue; others divide the chief aspects in different ways. The types of plan are even more diverse. One very interesting scheme—that of Messrs. Ross & Macfarlane, eliminates the difficulty of the sloping site by excavating and banking to a practicaly level platform and placing thereon a symmetrical building with longitudinal and transverse axes, and as a logical consequence has facades and approaches of fairly equal importance towards the campus and towards Pine avenue. In this scheme the large galleried museum, with top light, is placed in the centre of a large block of buildings which, though it contains two courts for light, one at each end of the museum, may yet be considered to represent a single building unit. The assembly room finds its place in the centre of the west end of the building. The whole block is centralized with the Royal Victoria Hospital on the other side of Pine avenue. As might be expected with a design set out on the symmetrical lines, the elevations are classical and monumental—a basement of rusticated masonry carries a range of tall pilasters framing the windows of two upper storeys. Slightly pitched roofs of moderate span, with valleys between, form an inconspicuous covering.

Of a very opposite character is the design submitted by Mr. Robert Findlay, whose buildings follow the outline of the site, enclosing an irregular open quadrangle in the middle. These buildings lend themselves to the varying levels of the ground, and in general the laboratories, class rooms, library, etc., look out towards the streets, with corridors of communication towards the quadrangle. On the side next the campus are placed the larger pieces—the museum and large lecture theatre. There is also on this side a minor students' entrance, with the students' common room, etc., in proximity. Another entrance, still of a secondary character, is from Carlton road, but the principal entrance—of a monumental and well-accentuated character, is in the middle of the Pine avenue front. As this is approached by a high flight of steps, entry is made at the top floor level.

The elevations generally are of a broad and simple classic character, such as lends itself without forcing the irregularities impressed by the nature of the site. The side next the campus has been left severely plain.

A third well-pronounced type of plan presented is that in which a long main building runs more or less parallel with Pine avenue and has wings attached at right angles, centrally, or at the ends, or both, thus forming an E or T plan. Of this type, although varying greatly from one another, are the plans of Messrs. Marchand & Haskell, E. & W. S. Maxwell and Brown & Vallance.

The design of Messrs. Brown & Vallance, as already mentioned, is the only one which quite emphatically selects the University grounds as its principal relationship. There is a secondary entrance of fair importance towards University street. Towards Pine avenue and the Royal Victoria Hospital on the other side, the rear of the building is presented with only a very minor doorway in the vicinity of the mortuary, etc. The plan roughly approximates the E type, the main part of the wings extending out towards the rear. Two principal entrances, with staircases in connection with them, are placed at the junction of the central block with the end wings. In the centre is the museum, top-lighted, and having two galleries. On each floor the outer corridors of this museum form the communication with the pieces in front and rear of the centre block. The museum cases are shown

arranged between the pillars that carry the galleries. The galleries themselves are carried well out beyond this line of pillars, so that there is ample passage-way on each side of the cases. In this way good corridors of communication all around the museum are secured on each floor. The main stairways of the building being in direct proximity to the museum, the museum itself is not cumbered by special stairs of its own. Anatomical and pathological specimens occupy separate galleries of the museum. The front of the centre block, which is on the lower side of the site, has the greater height, and here are arranged on the various floors storage room, stock rock, professors' rooms and reading rooms, both general and for the staff. These rooms overlook the campus and have a southeast prospect. In the rear of the centre block is the principal assembly hall, with its platform against the rear wall of the museum.

The seats are in rising tiers in a semi-circle. A wide corridor is carried all round the outside of the sweep, and cloak room accommodation is provided under the higher ranges of seats.

Each wing of the building is adapted to the conformation of the site. The west wing, which is the shorter, is placed at a higher level and contains the Histology and Hygiene departments and a small lecture theatre. The east wing is longer and contains the departments of Dentistry, Administration, Dissection and Pathology. A lecture theatre forms a projection on one side.

The secondary entrance from University street, and the more easterly of the campus entrances, are both in direct communication with the students' lavatory and cloak room accommodation, and also with the common room.

The elevations show mullioned windows, of the English domestic and collegiate type, pleasantly free from pretentiousness. Architecturally the building aims at the beauty that arises from the employment of graceful and pleasant methods of building rather than the decking out of structure with conventional display.

Messrs. Ed. &. W. S. Maxwell's designs, centering with the Royal Victoria Hospital, and probably approaching the character of that building more than any of the other designs, also provide more ample lighting than most of the other competitors.

The design of Marchand & Haskell, more concentrated on the site, rises high and is in this respect in conformity with the Hospital building.

Messrs. Hogle & Davis present a design in which the various blocks are arranged one behind the other in train fashion. The first block facing University street, contains theatres and laboratories. The second has an approach from Pine avenue, and contains museums and reading room. In the rear block are the Dentistry department and the pieces of smaller dimensions.

Messrs. Saxe & Archibald have divided their buildings into two fairly distinct blocks, with corridor connection, set at an irregular angle. The smaller building facing University street contains museums and lecture theatres. The other is of great length and breadth—the dissecting room is 64 feet by 63 feet. The approach is from Pine avenue, and the large assembly hall is placed centrally upstairs. The elevations show Ionic colonnades of monumental scale and Grecian character.

Messrs. Finley & Spence also provide for two buildings, but differently disposed in site and purpose. The smaller building, containing the library, is towards the campus. The larger building is entered from University street. Generally, a large square recurring unit of design has been adopted. Thus the library block is square and has been given a certain ordinance of architecture. South and north of the University street entrance a square block of similar design occurs as part of the main building. These recur at varying levels and spacings.

SMOKE NUISANCE DECISION.

The smoke nuisance was recently the subject of a very important decision by the New York Court of Appeals. The question the court had to decide was: In a country district suitable for country homes, does the use of soft coal in a factory so situated that thick, black smoke therefrom, great in volume and dense in quality, envelops and discolors a neighboring dwelling house, causing much discomfort and some financial loss to the occupants, constitute a nuisance, when such use of soft coal is not necessary for the practical running of the plant and is not a reasonable use of the manufacturer's property? The court decided that while the defendant's business was lawful and not of itself a nuisance, it was a nuisance as conducted, although a neighboring plant where anthracite coal was burned was not one. It was therefore ordered that the company must either burn hard coal or make such alterations in its plant that soft coal can be burned without causing offense. This opinion is particularly important because it does not refer to a smoky plant in a city, but to one in the country, where the house of the plaintiff is 840 feet distant. It therefore establishes the rule throughout the entire State that no boiler plant may be so conducted as to be a nuisance without being subject to a permanent injunction until it is rendered practically smokeless. Whether it is a nuisance or not must be determined from all the facts in each case, and this is likely to cause considerable controversy, but the decision as a whole is nevertheless of much technical importance. It is fortunate that the upper court did not uphold the decision of the trial court, which forbade the use of soft coal under all conditions. The time is at hand when soft coal must be used far more extensively than at present, for the supplies of anthracite are running short, except from collieries which it is expensive to work. There is no reason why soft coal should not be used, except the practically universal lack of knowlede of American people concerning the way to burn it without producing dense smoke. It is sometimes said that smoke is inevitable where soft coal is used; the complete ignorance shown by those who make such a statement can be readily demonstrated by a visit to any large European city, where soft coal will be found in general use but without causing any greater obscurity in the atmosphere than in New York City to-day.

Geo. Oakley & Son, cut stone contractors, have moved their office and plant from 156 Richmond street west to 278 Booth avenue, Toronto.

MASTER PAINTER'S RELATION TO ARCHITECT.

The paper which has been assigned to me by the Executive Committee, entitled "The Master Painter and His Relation to the Architect," is one which I consider to be a very important one, involving, as it often may, the comfort and happiness of one or both of these parties.

Now, the architect being the designer who has planned for the erection and completion of the building, and the master painter one of the agents through which he finishes and beautifies the building which he has erected, it is of the utmost importance that there should be harmony and confidence between the one and the other.

The architect, in letting the contract, is more at ease if he can feel that in the contracting painter he has a man who is thoroughly reliable and honest, who interprets the specifications aright, and does his best to carry them out according to his design and plan. Also the master painter is easier in his mind if he can feel that he has a thorough knowledge of the contract that has been awarded him, that all the details of his work have been made clear in the specifications, and that there is no danger of his being asked or forced to do much more work, or compelled to furnish much more material than was clearly indicated in the specifications, and if he can feel sure that a reasonable profit instead of a financial loss, will be the result of his labors.

Now, sir, if I may be permitted to say it, I think there is much room for improvement in this matter. It is well known to all that there are those in the painting trade who never intend to do what is called for in the specifications, but who are always trying, by the use of poor materials and bad workmanship, to "skin" the job and enhance their own profits. These are a great source of annoyance and trouble to the architect, who is thus handicapped in his desire to give to his client that which he has designed and planned for, and which the owner has a right to expect.

It is also well known, on the other hand, that even among the best informed and careful members of the architects' profession, there is a lack of definiteness and a vagueness of expression in the painter's specification, which often obscures much of the work which he is expected to do, in which case he frequently either suffers loss by a faithful and honest performance of his contract, or to avoid that loss is tempted to skimp the work, using cheap material and workmanship, whereupon difficulty arises, harmony flies, and between these two there is trouble and discord.

Now, why this obscurity? I cannot and do not believe that it is to throw a feeling of uncertainty around the amount of work to be done, and by so doing to get a cheaper tender for the proprietor. This would be extremely dishonest.

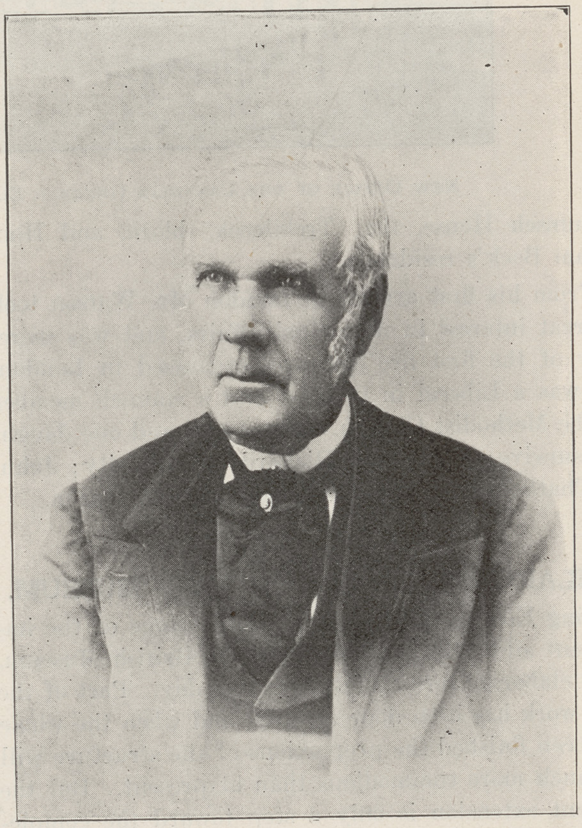
Then why might not the same careful detail be given to the painter's specifications as is given to the carpenter's, plumber's or any of the other trades? Why should the painter have to wade through all the other specifications in the trade to find out what he has to do? Could they not all be given just as easily and explicitly in his own?

Why could not some of the sizes be marked on the plans for us? Glass, for instance. I have known of great loss arising from the difference in the size which the plan measured and that which had to be provided to fill the opening. In a very large sheet of plate glass an inch or two makes an enormous difference. This is also true of leaded or other expensive glasses. If these sizes were marked on the plan the carpenter would then have to make the openings to receive the sizes indicated, and a frequent occasion of financial loss to the painter would be averted.

Now, sir, I believe that a little more careful attention given to these details would result in a better understanding between all concerned. Better work would follow, the contract would be more profitable, and the relationship between the master painter and the architect would be one of mutual harmony and confidence. Can not something be done to bring this about?

THE LATE GEORGE WATSON.

The death occurred in London on July 29th of Mr. George Watson, an architect well known some years ago when in active practice. Although 96 years of age, Mr. Watson was in full possession of all his faculties and up till the last took a keen interest in the affairs of the city.



THE LATE MR. GEORGE WATSON.

Deceased was born in Durham county, England, in 1812, and served an apprenticeship as carpenter in that place. In 1833 he married, and at once set sail for America, landing at Port Stanley. The young couple came directly to London, where Mr. Watson built the family home. There he worked at his trade, but during the rebellion of 1837-1838 entered the militia, serving as sergeant in the defence of the St. Clair Flats.

When the rebellion was suppressed, Mr. Watson

again engaged in the building business, later giving up the heavier work, and forming with Mr. Samuel Peters an architectural and land surveying firm. He was the first architect in London, and many buildings still testify to his good work. Among these are the Tecumseh House, the Trebilcock block, and Hon. Adam Beck's residence.

From his first arrival in London Mr. Watson took a great interest in municipal affairs, and was secretary of the first fire company organized in London. He was a Liberal in politics, and a staunch member of the Methodist Church. Three sons and one daughter survive: James and Richard, of this city; John, of Chatham, and Mrs. Gammage, of Port Huron.

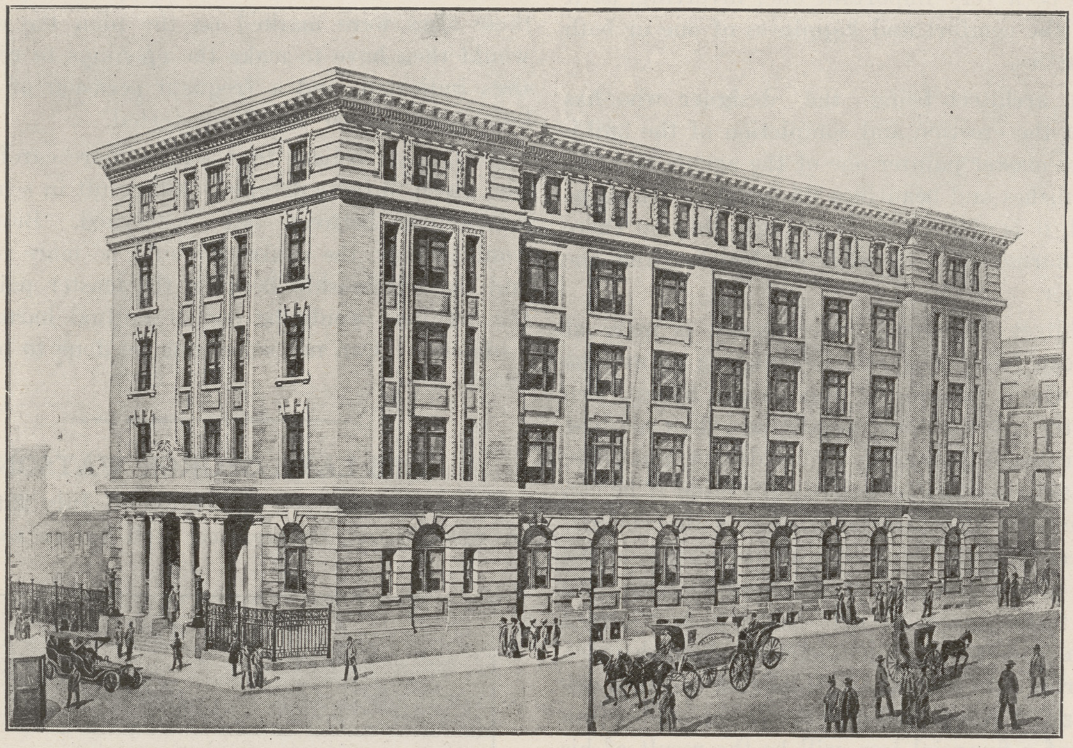
ENLARGEMENT OF BRITISH MUSEUM.

King Edward laid the foundation stone of the important additions to be made to the British Museum, with elaborate ceremonies, the other day. Part of the new work has been done already, and when the whole has been finished the proportions of the structure will be much more commodious than at present. But the present extension is only a step toward the completion of the perfected plan, which, according to the existing designs, will finally cover a square area of thirteen acres. The cost of the present improvements will be about $1,000,000. The new buildings, which are in the rear of the old structure, consist of a basement and sub-basement which will afford large storage space for printed and other material. Above these will be an extensive range of galleries for library purposes. Higher still will be a floor devoted to various studies and to students' rooms, and over all 380 feet of galleries in which the Egyptian and other collections will be displayed. Mr. J. J. Burnet, of Glasgow, is the architect. King Edward has been a trustee of the Museum for many years, and has proved his active interest in the institution in many ways.—New York "Evening Post."

OUR ILLUSTRATIONS.

Residence of Mr. W. P. Niles, Wellington, Ont.

From an old foundry Mr. Niles has built for himself a comfortable and imposing home. The alterations were conceived largely by the owner from a perusal of various publications and the utilization of suggestions gathered from observation.



New Office of the Canadian General Electric Company, King Street West, Toronto.

Exterior and Interior View of John C. Green & Company's Wholsale Millinery, 70-72 Wellington Street West, Toronto; Wickson & Gregg, Architects.

The ceaseless conflict that continually rages between architectural form and utilitarian purposes has perhaps been nowhere more apparent than in the designing of the store front. However, art and utility seem at last fairly well agreed. The recent tendency to make shop windows as large as possible is a demand brought about by the improvements required by our advanced civilization. The designer must furnish the largest possible plate glass area compatable with design and structural strength.

Old Wellington Foundry.

Canadian Architect and Builder Students' Competition for a Small Suburban House, to Cost $3,000.

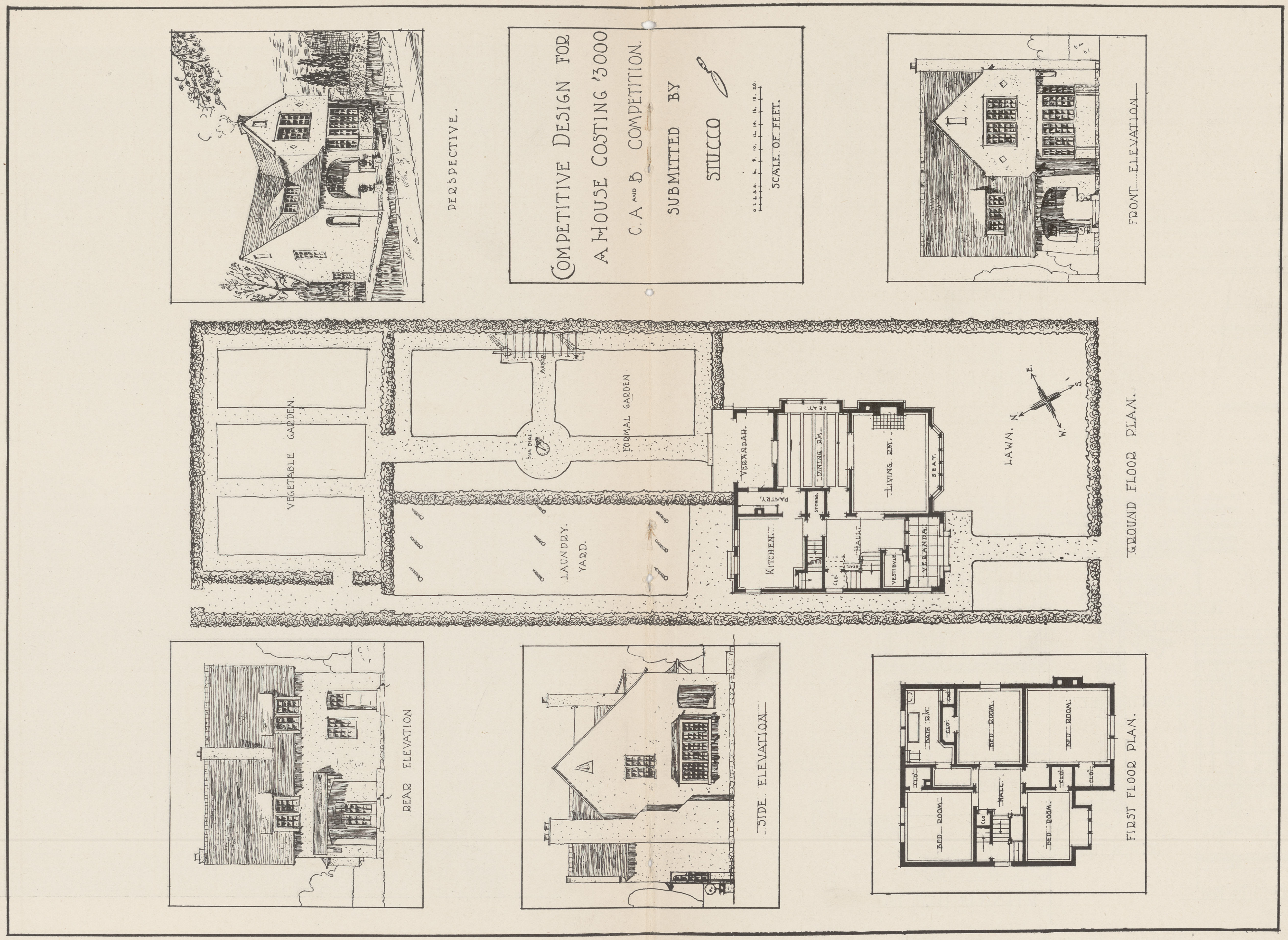
1. Design by 'Stucco'' (sixth in competition).
2. Design by ''Tri-angle'' (seventh in competition).

VIEWS OF RESIDENCE OF MR. W. P. NILES, WELLINGTON, ONT.

FRONT OF JOHN C. GREEN & COMPANY'S WHOLESALE MILLINERY, 70-72 WELLINGTON ST. W., TORONTO.
WICKSON & GREGG, ARCHITECTS.

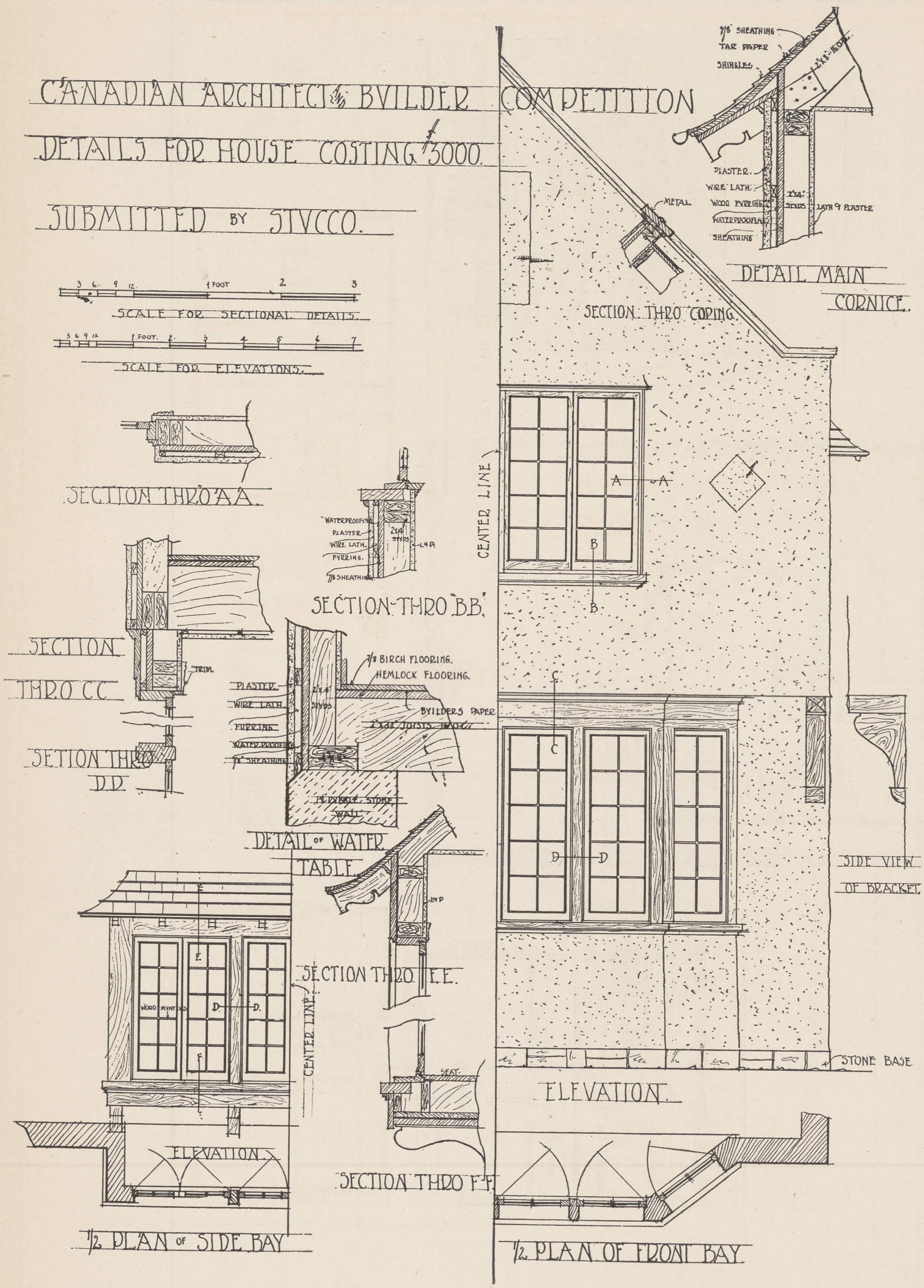
INTERIOR VIEW OF JOHN C. GREEN & COMPANY'S WHOLESALE MILLINERY, 70-72 WELLINGTON ST. W., TORONTO.

WICKSON & GREGG, ARCHITECTS.



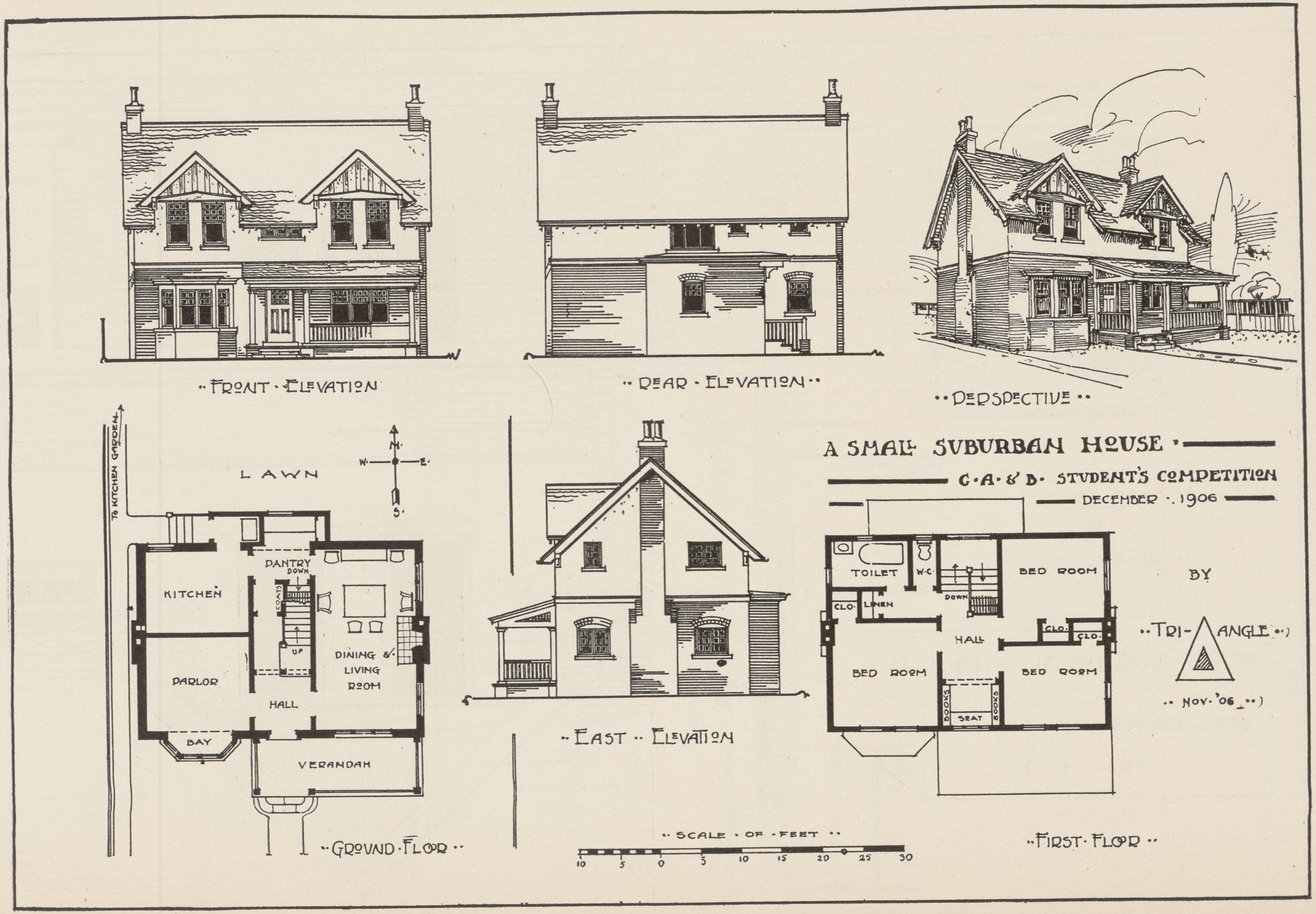
Canadian Architect and Builder Student's Competition for a Small Suburban House to Cost $3,000.

Design by "Stucco," (Sixth in Competition).



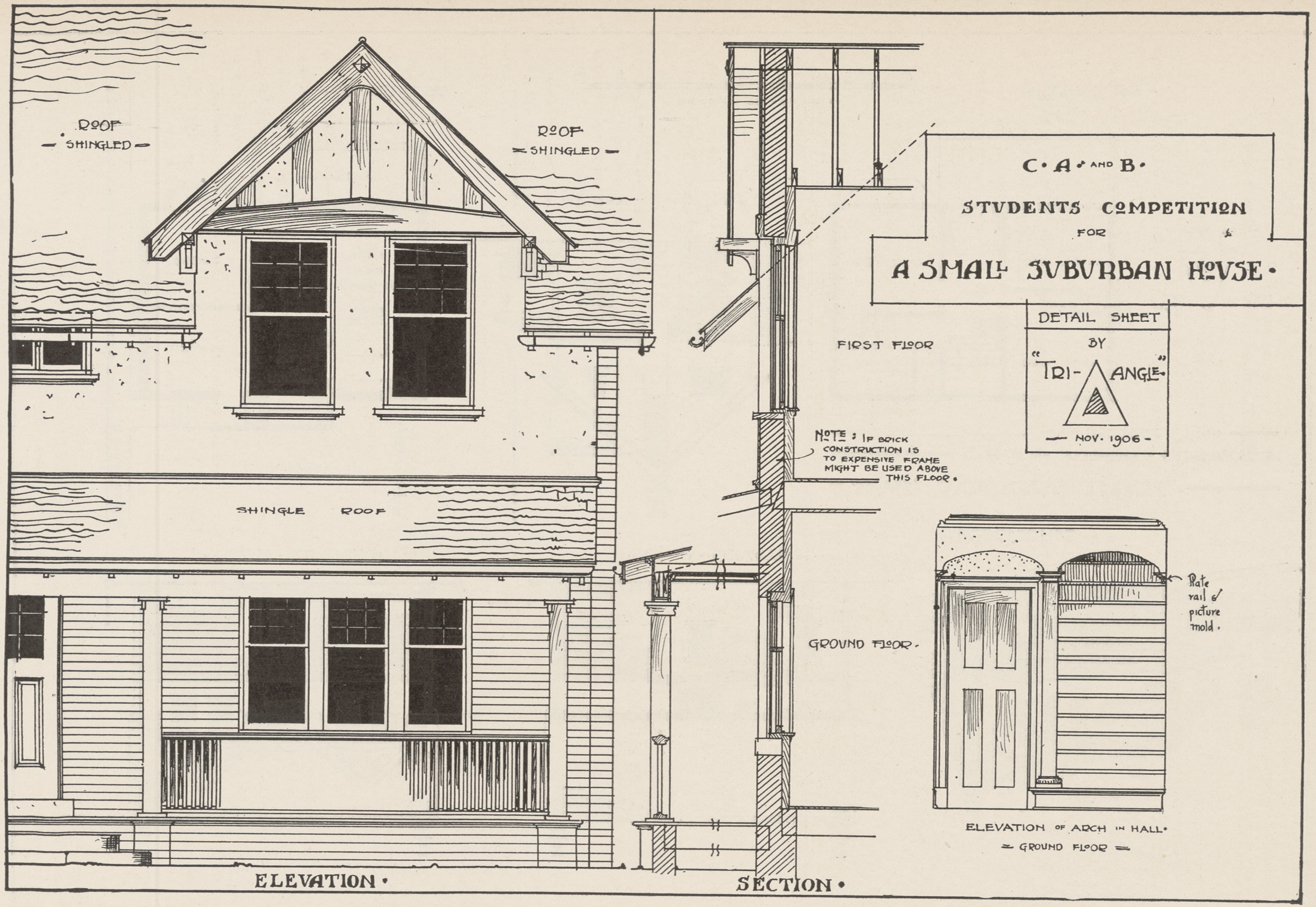
Details of Sketch by "Stucco"

Illustrating Design on Pages 150 and 151.



Canadian Architect and Builder Student's Competition for a Small Suburban House to Cost $3,000

Design by "Tri-Angle" (Seventh in Competition).



Details of Sketch by Tri-Angle.

Illustrating Design on Page 153.

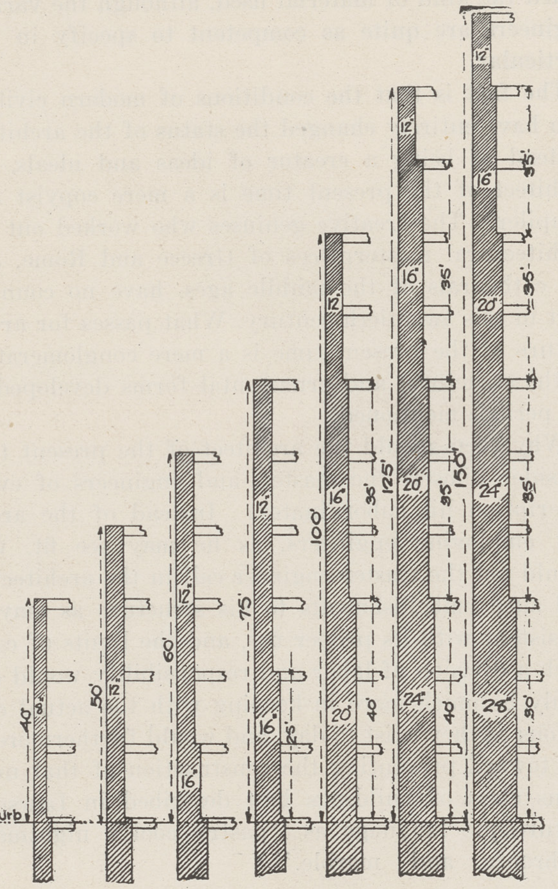
WALLS FOR BUILDINGS

The following dimensions are applicable to the walls of apartment houses, asylums, club houses, dormitories, convents, hotels, dwellings, schools, hospitals, studios, laboratories, tenements, lodging houses and parish buildings:—

Note.—The total heights cannot be increased. The intermediate heights can be varied, the various heights being to the nearest tier of beams.

No. 1. The walls above the basement, dwelling houses not over three storeys and basement in height, and not over 20 feet in width, and not over 55 feet in depth shall have side and party walls not less than 8 inches thick with front and rear walls 12 inches thick.

No. 2. Walls of dwellings over 20 feet in width and not over 40 feet in height shall be at least 12 inches thick. Walls of dwellings 26 feet in width between bearing walls, and over 40 feet in height, not over 50 feet in height, shall be at leaast 12 inches thick above the foundation walls. No wall shall have a 12 inch portion measuring more than 50 feet high.



No. 3. If over 50 feet, and not more than 60 feet high, the walls shall be at least 16 inches thick in the story above the foundation walls and thence at least 12 inches thick to the top.

No. 4. If over 60 feet and not over 75 feet high, the walls shall be at least 16 inches thick above the foundation walls to a height of 25 feet or to the nearest tier of beams and thence at least 12 inches thick to the top.

No. 5. If over 75 feet, and not over 100 feet high, the walls shall not be less than 20 inches thick above the foundation walls to a height of 40 feet, or to the nearest tier of beams, thence at least 16 inches thick to a height of 75 feet, or to the nearest tier of beams and thence at least 12 inches thick to the top.

No. 6. If over 100 feet and not over 125 feet high, the walls shall not be less than 24 inches thick above the foundation walls to a height of 40 feet, or to the nearest tier of beams, thence at least 20 inches thick to a height of 75 feet, or to the nearest tier of beams, thence not less than 16 inches thick to a height of 110 feet, or to the nearest tier of beams, and thence not less than 12 inches thick to the top.

No. 7. If over 125 feet, and not over 150 feet high, the walls shall not be less than 28 inches thick above the foundation walls to a height of 30 feet, or to the nearest tier of beams, thence at least 24 inches thick to a height of 65 feet or to the nearest tier of beams, thence at least 20 inches thick to a height of 100 feet or to the nearest tier of beams, thence at least 16 inches thick to a height of 135 feet or to the nearest tier of beams, and thence at least 12 inches thick to the top.

The following includes walls for armories, breweries, churches, cooperage shops, court houses, factories, foundries, jails, libraries, light houses, power houses, machine shops, markets, mills, museums, observatories, office buildings, police stations, printing houses, public assembly buildings, pumping buildings, railroad buildings, refrigerating houses, slaughter houses, stables, stores, sugar refineries, theatres, warehouses, wheelwright shops:—

No. 1. The walls of all warehouses 25 feet or less in width between walls or bearings shall be at least 12 inches thick to a height of 40 feet above the foundation walls.

No. 2. If over 40 feet and not over 60 feet in height, the walls shall be at least 16 inches thick above the foundation walls to a height of 40 feet, or to the nearest tier of beams and thence at least 12 inches thick to the top.

No. 3. If over 60 feet and not over 75 feet in height, the walls shall be not less than 20 inches thick above the foundation walls to a height of 25 feet or to the nearest tier of beams and thence at least 16 inches thick to the top.

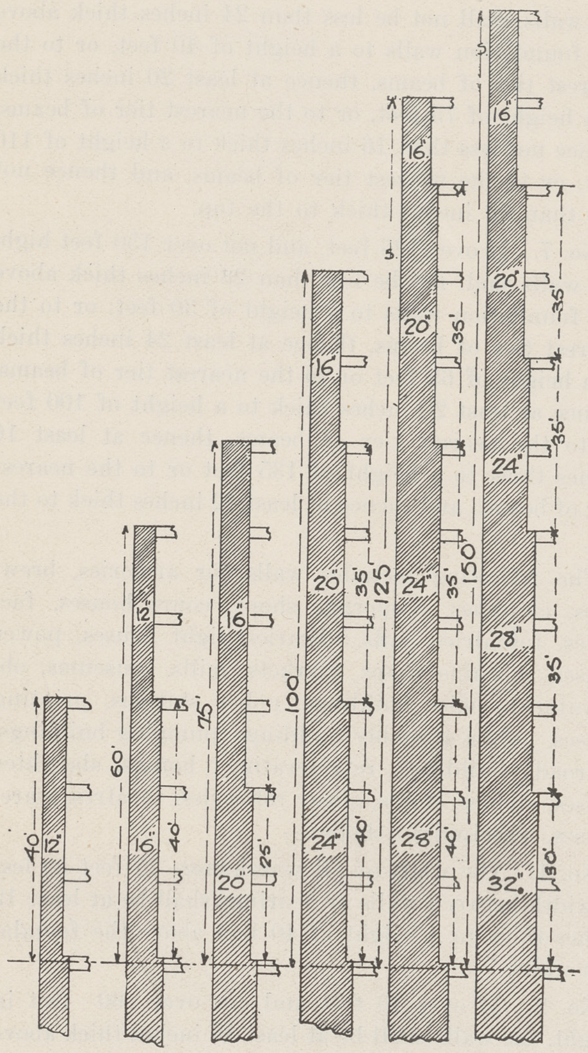
No. 4. If over 75 feet and not over 100 feet in height, the walls shall be at least 24 inches thick above the foundation walls to a height of 40 feet, or to the nearest tier of beams, thence not less than 20 inches thick to a height of 75 feet or to the nearest tier of beams, thence at least 16 inches thick to the top.

No. 5. If over 100 feet and not over 125 feet in height, the walls shall be at least 28 inches thick above the foundation walls to a height of 40 feet, or to the nearest tier of beams, thence not less than 24 inches thick to a height of 75 feet or to the nearest tier of beams, thence not less than 20 inches thick to a height of 110 feet or to the nearest tier of beams, thence at least 16 inches thick to the top.

No. 6. If over 125 feet and not over 150 feet in height, the walls shall be at least 32 inches thick above the foundation walls to a height of 30 feet or to the nearest tier of beams, thence at least 28 inches thick to a height of 65 feet or to the nearest tier of beams,

thence at least 24 inches thick to a height of 100 feet or to the nearest tier of beams, thence at least 20 inches thick to a height of 135 feet or to the nearest tier of beams, thence at least 16 inches thick to the top.

For walls over 150 feet in height, each additional



25 feet in height, or part thereof, next above the foundation walls shall be increased 4 inches in thickness. The uppermost 150 feet of wall remaining the same as specified for a wall of that height.—Louis A. Abraham, in "Architects' and Builders' Magazine."

ENGINEER OR ARCHITECT?

That the architect is in danger of losing prestige by reason of the apportioning of his work to engineers and others who are little by little narrowing the scope of his operations is made the subject of an article which recently appeared in "The Illuminating Engineer," and which reads as follows:—

With the enormous increase in complexity of knowledge which has been the outcome of scientific progress, the term "engineering" has proportionately enlarged its scope and meaning, until, at the present time, it is made to cover almost every phase of human activity. It has even been seized upon by the professions entirely apart from material activity, the term "commercial engineer" furnishing an example.

Broadly speaking, an engineer is one who applies scientific knowledge to practical use.

Keeping this definition in view, what is the distinction between the engineer and the architect? The design and construction of a modern building certainly involves the scientific application of physical facts and laws to a very large extent, and to just such an extent is the designer of the building an engineer. There is no essential difference between designing the steel framework for a building and a steel structure to be used as a bridge; and the latter is clearly within the province of the civil engineer.

Similarly, the installation of an electric lighting plant is no less a mechanical and electrical engineering problem when put into a private building than when put into a special building and called a "central station." The heating ventilating, likewise, calls for purely engineering skill; and last, and too often least, the illumination is, or should be, in full charge of an illuminating engineer.

What then is left to the architect? Only the division of the space into the various rooms, and the decorative details of the structure. To these might be added the kind of material used, although the various engineers are quite as competent to specify in this particular.

The fact is that the conditions of modern civilization have entirely changed the status of the architect. Instead of being a creator of ideas and ideals, the architect of the present time is a mere copyist and compiler. The creative geniuses who worked out the architectural masterpieces of Greece and Rome, and the cathedrals of the middle ages, have no counterpart in this twentieth century. What passes for architecture at the present time is a mere conglomeration of the structural and ornamental forms developed in the periods mentioned.

Why then should the architect of the present time consider himself the master, and engineers of every description his subordinates? Instead of the architect employing engineers, as he may see fit, why should not the master engineer call in the architect to add such embellishments to his structure as may be consistent with its proper use, and the limits of cost? Such a division of labor and responsibility would certainly be much more in keeping with the actual conditions as they exist to-day, and would furthermore go far toward preventing the construction of that numerous class of buildings best described in Lawson's picturesque language as "pastry cook's nightmares in bronze and marble."

STREET LIGHTING IN THE CITY OF LONDON.

Being determined to ascertain the best system of street lighting by means of electricity, the Corporation of the City of London has placed the City of London Electric Lighting Company and the Charing Cross Supply Company in open competition. It is realized that during recent years great advances have been made in the perfecting of illumination by the electric current, while the cost per lamp has been considerably reduced. The Streets Committee have, therefore, made arrangements for the lighting of Holborn Viaduct, New Bridge street and Cannon street by the respective supply companies in open competition with the best available electric apparatus. The competition will take place during the winter, when both companies will demonstrate the value of the latest appliances at their respective commands.

SOME VARIETIES OF STONE BUILDING.

By W. M. Brown, C.E.

(Article Written Specially for the Architect and Builder.)

Stone-building is of very ancient origin,and the methods employed in its manipulation are regulated by the purposes for which the buildings are erected. In the primitive times, except among the most civilized nations, stone-building was of the rudest description. Utility and durability were its characteristic elements, and not until the dawn of the arts and sciences, and their development in the realm of architecture, do we find any great advance in the more elaborate and refined methods of construction.

Stone is one of the earliest materials used for building purposes, and it is likely to maintain its prominent position, so long as it is accessible, and not too expensive. In Canada, however, much has yet to be discovered as to its abundance and quality, in order that it may become universally adopted. A very important consideration is the quality of the stone to be used for building purposes, whether it be of a hard or soft texture, and whether it be porous or almost impervious to a damp atmosphere.

There are generally two parts in the stone-building of walls, viz., ''Backing'' and ''Facing.'' The former portion is placed behind the latter, and is generally composed of rough stones, chosen by the builder, for the body of the work, and built compactly with the best mortar. The ''Facing'' of the wall, which is placed before the ''Backing,'' is of greater importance from an artistic point of view, as it is upon its quality and adaptability for architectural design that it is chosen to occupy the position. It is the ''Facing,'' and the manner in which the stones are wrought, that designate the class of work.

There are several varieties of stone-building, and we would indicate some of these by describing their completed appearance and method by which they are obtained. The class of stone known as ''rubble work'' is composed of stones of irregular size and shape that are placed in a wall, after they have been sorted and rough-shaped to fit against each other, and hammer-dressed on their faces with the waller's hammer, as may be required for the quality of the work. In the rougher classes of ''rubble work'' there is generally no selection of the stones, as the waller takes the stone nearest at hand that he thinks will suit his purpose, and packs in smaller stones between the larger ones. The rough nature of the work often leaves many spaces between the joints, both on the face and interior of the wall; these are generally packed up or pinned with spalls, which are the pieces hewn off the rougher stones, in order to get them to fit into place. The spalls should not be placed in the heart of the work, as they are liable to drive like wedges when the superincumbent weight presses upon them, and consequently the facing stones may be forced out.

Particular attention should be given during the building of rubble, as well as in the case of all masonry walls, to see that they are well bonded transversely, and not built up with too thin scales on each face or tied together by ''through stones,'' with the core or hearting filled in with small pieces. This is a very common fault with builders, who depend upon the mortar to give stability to a wall which, without it, would give way under its own weight. The stones best for rubble masonry are those that scabble freely, and such as lie in 4 or 5 inch beds. Basalts and those stones of a crystalline character are difficult to use, as they are apt to fly under the hammer, but granite and sandstones work in well. Rubble may be described as either ''uncoursed,'' ''irregular'' or ''random-coursed,'' ''worked-up-to-courses,'' or ''coursed,'' according to the character of the stone at disposal.

There are some stones, which from their intractable nature, and the absence of any distinct lines of bedding, are especially adapted for uncoursed rubble, while other stones have lines of layers or courses, and, therefore, should be used in square rubble. Courses of random, common or rough rubble vary in depth from 12 to 18 inches. ''Square-uncoursed,'' ''random-coursed,'' irregular-coursed,'' ''snecked'' or ''squared rubble,'' are five names designating practically the same description of work. There is a certain amount of coursing, but it is not regular or continuous; jumpers are used, but no spalls, and if careful attention is given to bond, then the strength of the wall is considerable.

Random-rubble, with hammer-dressed joints and no spalls on face, often termed ''cobweb'' rubble, is chiefly formed with broken boulders or field stones. The joints lie in all directions, and it requires considerable experience and skill to make good work. In regular-coursed rubble, the courses vary frequently in depth, but are seldom more than 9 to 10 inches deep. Good stone found in thin beds in the quarry is commonly used.

In the rougher descriptions of rubble work, ''lacing'' courses are used to give the wall additional cohesive strength; these consist of two or more well-bonded courses of masonry or brickwork laid at short vertical intervals.

''Block-in-course,'' or ''hammer-dressed ashlar,'' is intermediate between the best rubble and ashlar. The coursing is regular, and the blocks are roughly squared; it is often constructed of shoddies, which are good stones less than 12 inches deep. The length of each stone is generally from three to five times its depth, and the breadth from one and a half to twice its depth. The exact proportions depend on the amount of resistance which the stone offers to cross bearing. The same rules as to proportions apply to ashlar work. Ashlar masonry is composed of large blocks, squared and regular in size, laid in courses varying in depth from about 10 to 14 inches; the bed joints should be out of winding, but not smooth, and should never be worked slack (hollow-on-bed) and underpinned with spalls. Such method of procedure concentrates the weight on a small area, and leads to crushing or to the joints flushing.

Joints should be as thin as the class of work allows, but never so much as to leave an insufficient bed of mortar to extend the pressure over the whole joint, as this would lead to flush joints. Sheet lead has sometimes been inserted in joints subject to great pressure,

so as to equalize it, but it was found that it has a tendency to squeeze outward and flush the joints, thus more than counter-balancing any good it might do. The term "regular-coursed" is given to ashlar when the courses throughout the face of the building are all of the same depth. When the courses vary in depth, it is termed "irregular-coursed" ashlar. If the courses are not continuous, but broken, it is "random" ashlar, but the last class of work is uncommon. The bond adopted follows the general idea of Flemish, but as all stones are not of an uniform size, considerable freedom is allowed in bonding, and except in the best class of work, no attempt is made to keep the perpends. The courses should range with the quoin stones and dressings. Joints can be made less than one-eighth inch thick. Plasterer's putty is frequently used to make the outer part of the joint; it extends inward about two inches.

Previous to being set, each stone is laid dry in its place to ascertain that it fits properly. The amount of work that we find upon the face of ashlar varies considerably, from the simplest form to the most complex. Rebated joints and V joints are used to emphasize the joints, while at the same time they prevent them from flushing. This class of ashlar work is termed "rusticated." A wall built of solid ashlar is generally expensive, and so the term has come almost to imply a facing of ashlar with a backing of rubble or brickwork. The ashlar is frequently only four inches, and rarely more than six inches thick, with bond stones projecting into the backing. The ashlar should average about eight inches on the bed, and should bond transversely with the back. Headers, having a length of at least two-thirds of the thickness of the wall, should be laid, one to every superficial yard of face. The backing, if rubble, should be built in courses, each levelled up to coincide with the ashlar courses. If of brick, the ashlar courses must be of suitable depth to allow of the same treatment. The greater number and greater thickness of the joints in the rubble or brickwork lead to more compression in the backing than in the facing, and this tends to cause the wall to bulge outward. This effect may be to a large extent avoided by building in cement or a quick-setting mortar. Self-faced, natural-faced, rock-faced, are terms all implying the same meaning, and indicate that the face of the stone is left rough as from the quarry, though it may have been scabbled with the hammer to remove irregular projections. A wall built of natural-faced stone is sometimes termed "rustic-faced," but it must not be confounded with the rusticated joints previously mentioned. There are several other classes of work, such as "rubbed work," "vermiculated work," "sunk work," "circular work" aand moulded work."

METAL COVERINGS CATALOGUED.

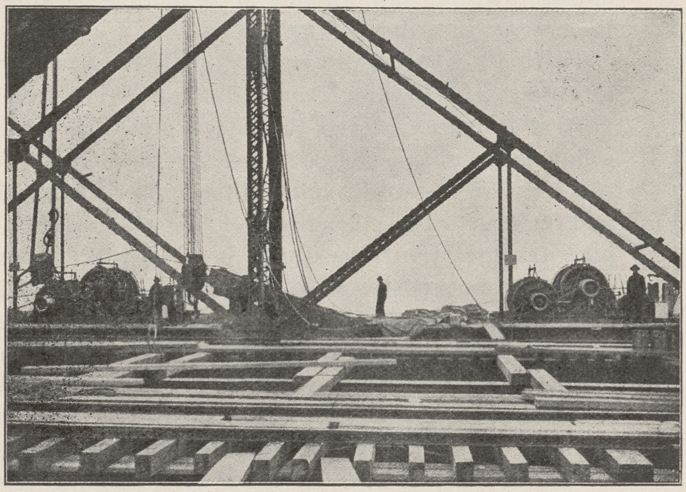
Another comprehensive and beautifully illustrated catalogue has just been issued by the Metal Shingle & Siding Company, Limited, Preston. No better method of forming an estimate of the constantly increasing popularity of metal as an exterior and interior finish can be adopted than to glance over the many pages of artistic designs presented in this catalogue. The company are to be congratulated upon the excellence of this publication.

BRIDGE BUILDING BY ELECTRIC POWER.

In the construction of the huge bridge across the St. Lawrence river at Quebec the entire work of erecting is being done by electric power. The bridge is being built for the Quebec Bridge Company, and the Phoenix Bridge Company, of Phoenixville, Pa., is doing the construction work. The bridge is of the cantilever type and will have a span of 1,800 feet in the clear. The work of erecting is being conducted from the shore ends without the use of any false work, one side being first extended 900 feet out from its tower, where it will remain perhaps more than a year seemingly unsupported until the other side is brought out to meet it.

Two steel travellers of large dimensions are doing the work of placing the bridge members in place. Each traveller is equipped with two Lidgerwood electric hoists of the most powerful type ever made. One traveller rests upon the bridge deck and extends over the end of the cantilever, being moved forward as fast as the parts it handles are put in place.

The other traveller is the more interesting. It is suspended between the bridge deck, with its upright



Electric Lidgerwood Hoists, Used in the Construction of the Bridge of the Quebec Bridge & Railway Company Across the St. Lawrence River, Near Quebec.

parts rising more than 300 feet high above the ground so as to pass on either side and above the tops of the towers of the bridge, each of which is 300 feet high.

The accompanying illustration shows the deck of this traveller and the two electric hoists with which it is equipped. Each of these hoists has drums 40 inches in diameter and 50 inches on the face and is capable of lifting 20,000 pounds on a single line. They have handled single bridge parts weighing 110 tons. The hoists are equipped with direct current motors of 150 horse-power each and are operated with 220 volts.

Besides the four big hoists for the travellers there are a dozen or more smaller electric hoists used in connection with the work.

It is reported that a new sand-lime brick-making plant will shortly be established in Vancouver, B.C. Mr. R. B. Masten, of Toronto, has investigated the sand in the neighborhood and has pronounced it particularly suitable for making bricks. It is thought that the establishment of such a plant will do much to relieve the present shortage of building material in the west.

THE FAILURE OF A REINFORCED CONCRETE BUILDING AT PHILADELPHIA.

The three storey and basement reinforced concrete building in course of construction for Bridgman Bros. Company, manufacturers of steamfitters' supplies, at 15th street and Washington avenue, Philadelphia, collapsed on July 9th, killing two of the workmen and injuring, more or less seriously, about thirty others. The building, which is to be used as an annex to the present plant, is built of reinforced concrete columns, girders and floor slabs, with brick face walls. Although it adjoins existing brick buildings on each side, the side walls are of entirely independent construction.

The design was made by Milligan & Webber, a firm of Philadelphia architects, with the advice of Mr. Amos W. Barnes, consulting engineer, and was fully approved by the Bureau of Building Inspection of the city. Some trouble had been experienced with the foundations in underpinning the walls of the adjoining buildings, but the footings as finished were fully capable of bearing the load upon them. Floors were designed for loads of 180 pounds per square foot on the first floor and 120 pounds per square foot on the second and third floors, with 30 pounds per square foot on the roof. The reinforcement is of straight round rods. The columns are reinforced in the four corners by vertical rounds tied together with wire for ease in manipulation, but not to give additional strength by hooping. Very heavy reinforcement was placed in the beams and girders. In addition to the usual horizontal straight rods, shear stirrups made of ordinary rounds bent in U shape and varying in size with the depth of the girder, were placed near each beam and girder end. The exact size and position of these stirrups are not at all well shown on any of the available drawings, and an inspection of the destroyed portion failed to discover their presence in several of the beams and girders, as provided for in the design. With the exception of these omissions, which are not at all conclusive, owing to the shattered nature of the debris, the design of reinforcement has been well adhered to. In order to provide resistance to continuous beam action over supports, every other tension rod was raised from the lower edge of the beam to the upper at each column and carried through the column in this position, wire ties connecting beam and column reinforcement. Floor slabs were reinforced with 3 inch wire mesh.

The concrete used was hand mixed, and extremely high in cement, consisting of one part cement, one part sand and two parts stone. The cement was of standard brand, but as far as can be ascertained not subjected to any but the regular mill tests; the sand was of good grade and quality; the stone for the first two storeys of the building was a crushed trap or bluestone, and for the third storey and roof a clean, hard gravel. Where proper time had been allowed it to set, the concrete was hard and compact, fully equal to any load to which it could have been legitimately subjected.

At the time of the accident, the first three floors had all been completed and the forms removed, the newest concrete in these lower floors being about a month old. All of the columns supporting the roof were finished and on the north half of the building (where collapse occurred) the roof girders and slabs had been in place 5 1-2 days. Form work was going on at the time upon the girders and slabs of the southern slope of the roof. The girder spans of 17 feet were supported by seven struts spaced about 2 feet. According to the regulations of the city of Philadelphia, these struts should have been allowed to remain in place two weeks from the time of depositing the concrete. However, on the day of the collapse, the sub-foreman in charge of concreting ordered a negro laborer to remove every other strut from under each of the roof girders, thus leaving the girder to be supported by three or by four struts, according as the laborer understood the order. The sub-foreman did not remain to see this work started, but left for another job which his company was building. The negro transmitted the order in turn to some Italian laborers who, from ignorance of the language, misunderstood and proceeded to knock out every strut under girders holding concrete which had been deposited but 5 1-2 days previous.

It is not known just how far this action proceeded, but beginning at the back of the building, where the removal work probably started, the whole existing roof structure gave way and, pulling with it the girders and columns, broke through each floor in succession. The most northerly bay of the first floor was broken and the whole mass of debris carried through to the basement. The bay directly south of this, on the first floor, held under the heavy impact of the falling mass and although the girders and beams were badly cracked, the floor system did not give way.

The concrete on the second floor, which had been in place well over a month, is very solid and hard, and the girders at this point failed in direct vertical cracks, stripping the concrete from the encased rods. The connections at the columns between reinforcement must have been very firm to permit of failure in this manner. The floor slabs broke clean at the girder edge, each piece of wire mesh being broken off there and not pulled out from the remaining slab.

An examination of the concrete in the structure shows that the material in the lower part of the building, which had been in from one to two months, was hard and solid and of as good structure and strength as the best. The material taken from the upper part of the work, which had not had sufficient time to set, was of a more fragile nature, somewhat crumbly and easily broken, showing that the set of the concrete had not advanced to a strength sufficient for the removal of supporting forms. Owing to the very low pressure in the water mains at this low-lying part of Philadelphia, it was difficult to get water up to the roof of the building to wet down the concrete in setting, and so this very important operation was omitted altogether in the upper storeys. A careful investigation is now being made by the building department of the city and also by experts for the coroner's inquest, but unless some new developments arise which can in no way be found at the present time, the accident seems to have been due entirely to the premature removal of supporting struts from under the roof girders. Considering the state of the concrete in the upper part of the building, it is certain that the safety of the structure would have been seriously endangered by the removal of even every other strut, as ordered by the sub-foreman. The removal of every strut from forms containing little better than a hard mud was certain to cause collapse.

The sub-foreman who ordered the removal of the struts has been held by the coroner for $3,000 bail, charged with criminal negligence. The coroner's jury has not yet reported on the case.—"Engineering News."

[NOTE.—Contributions suitable for publication in this Department are invited from subscribers and readers.]

THE SEPTIC TANK.

One of the most satisfactory methods for sewage disposal in small towns is that which makes use of the septic tank. This tank is constructed of brick or stone, well bedded in cement to prevent leakage, and is built at such a level as to allow the discharge pipe D, which is of glazed tiles four inches in diameter, to leave it at a depth of not more than twelve inches beneath the surface of the earth. Where the surrounding land is level, this tank may be located close to the building, where, if covered with earth and sodded over, it will not cause inconvenience. If more convenient, it may be placed any distance from the house, and the inlet pipe E laid along a mound or ridge of earth, and covered with earth to protect it from the frost; this pipe must under any circumstances have a slight continuous fall from the building, and must enter the tank at the top as shown. If, however, there is a considerable slope to the land, the tank may be buried beneath the surface, it being borne in mind that the branches from pipe D, which may be taken off at any distance from the tank, must not be more than twelve inches beneath the surface and must be perfectly level. From pipe D about every two feet—ordinary T fitting will just give the desired length—are run branches of field tiles (Fig. 2) four inches in diameter, the total contents of which should be equal to the amount of water which will be discharged at each operation of the valve, and allowing thirteen tiles to every cubic foot to be discharged, the number required will be readily found. The bend connecting the tank to the system of sub-surface tiles should be of iron, solidly cemented into the bottom of the tank to allow of the caulking in of the valve with lead. This

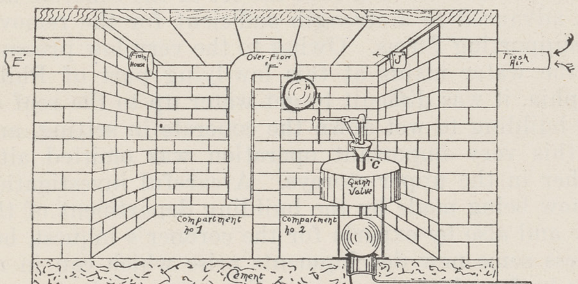


FIG. 1.

valve, manufactured by Somerville, Limited, Toronto, can be set at any level, will open and close automatically. It overcomes the only objection ever made to the septic tank system, viz., that when the emptying of the tank depended upon a servant or some member of the family to pull a plug at regular intervals, replacing it when all the liquid had escaped, it was sometimes forgotten and the tank overflowing caused the pipe between it and the house to fill up, thereby causing a great deal of annoyance and expense.

It will be noticed that a dividing wall is built in the centre of the tank to the height of about two inches from the top, the latter space being left for the free passage of fresh air. In this partition is built overflow F, the lower end of which should be "caged" with wire netting, three-quarter inch mesh, to prevent paper, etc., from passing through with the water. Pipe J permits the entry of fresh air, which passes over the sewage and up through the soil pipe E to the roof.

The operation of the tank is as follows:—All the

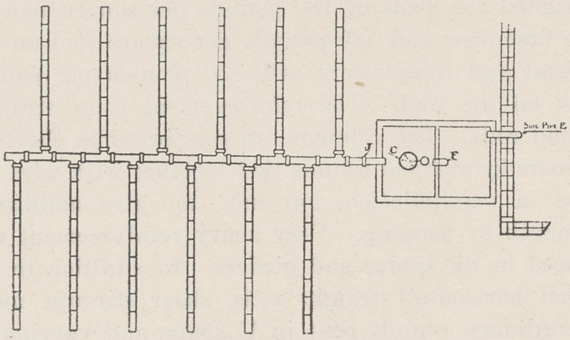


FIG. 2.

sewage from the building enters the tank through pipe E, filling compartment No. 1, the solids being compelled to float by the gases generated underneath. When this compartment is filled the liquid overflows through F into compartment No. 2, the valve C of which is closed. When, however, the liquid rises to the level at which float H is set, the valve opens, discharging the whole contents of compartment No. 2, be it fifty or five thousand gallons, into the system sub-surface tiles, through which it soaks into the earth, there to be taken care of by nature as already explained.

As the valve closes automatically when the tank is nearly empty, it will be seen that sufficient time will be given for that which has just been discharged to soak away before the tank fills again, and the operation is repeated.

A word respecting the solid portion of the sewage retained in compartment No. 1. The value of the system will be appreciated when it is stated that so thorough is the action of the millions of bacteria on this body, causing the almost immediate disintegration and decomposition of everything entering the tank, that tanks, when opened after a year's use, and into which the sewage from buildings containing many inmates was emptied, were found to contain not more than two or three pails full of a kind of earthy substance, from which scarcely any odor was perceptible. It must be borne in mind, of course, that no disinfectants are necessary with this system, and nothing in the shape of chemicals should be allowed to enter the tank if the life of the bacteria, which is so essential to its success, is to be preserved.

Regarding the size of the tank necessary, it may be said that for an ordinary family a tank four feet long by three feet wide, and from thirty to thirty-six inches high, would be sufficient, while for hotels or other large institutions, one large enough to hold about twelve gallons for each inmate would be ample.

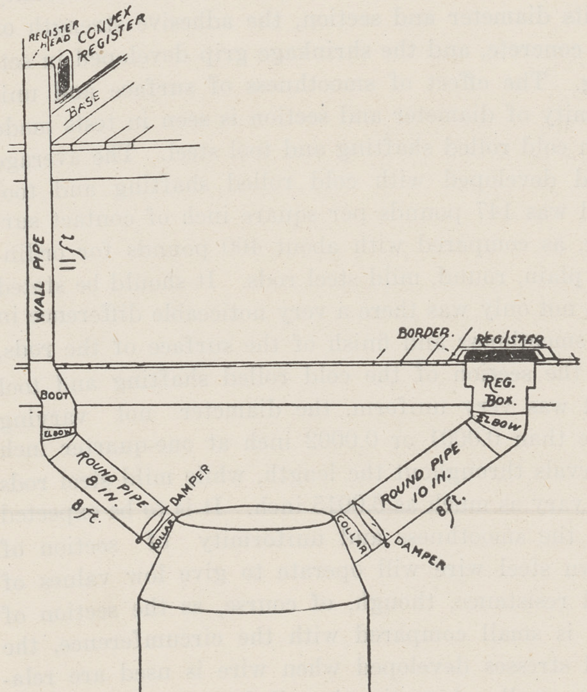
The septic tank system has the endorsation of all scientific men who have given the subject of sewage disposal close study. It will not give any trouble if built according to the directions given, and, contrary to the general supposition, it will not freeze in winter.

HOT AIR FURNACE PIPING.

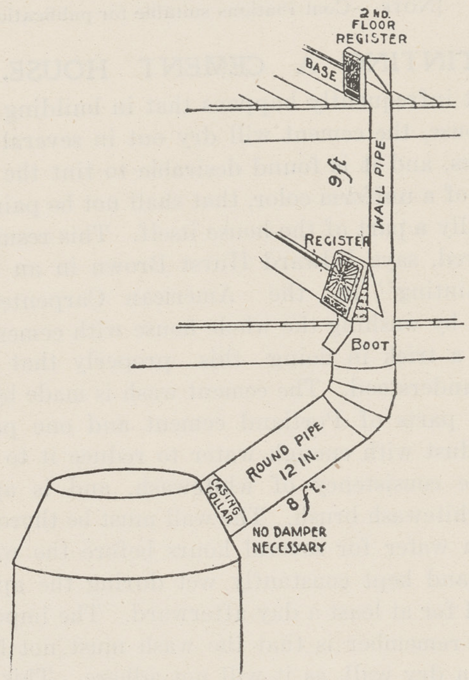
In order that furnace dealers and contractors may more clearly understand how two rooms (one on the first floor and one on the second) can be heated with one large basement pipe in place of two smaller pipes, the following table showing the difference in the number of cubic feet of air discharged per minute through a given sized pipe at different velocities is given in "The Improvement Bulletin."

5 inch	14 cubic feet	21 cubic feet
7 inch	27 cubic feet	40½ cubic feet
8 inch	35 cubic feet	52½ cubic feet
9 inch	44 cubic feet	66 cubic feet
10 inch	55 cubic feet	82½ cubic feet
12 inch	79 cubic feet	118½ cubic feet
14 inch	107 cubic feet	160½ cubic feet
16 inch	140 cubic feet	210 cubic feet
18 inch	177 cubic feet	265½ cubic feet
20 inch	218 cubic feet	327 cubic feet
22 inch	264 cubic feet	396 cubic feet
24 inch	314 cubic feet	471 cubic feet
26 inch	369 cubic feet	553½ cubic feet
28 inch	428 cubic feet	642 cubic feet
30 inch	491 cubic feet	736½ cubic feet
36 inch	707 cubic feet	1,060½ cubic feet
40 inch	873 cubic feet	1,309½ cubic feet

It will be seen, therefore, that sufficient warm air



can be supplied with a 12 inch round pipe connected to a No. 15 register, for heating two rooms, one above the other, that would require (with the 1837 method of installation) a 10 inch round pipe for the first floor room, and an 8 inch round pipe connected to a 3 1-4 by 12 or number 8 safety wall pipe for the second floor room. For instance, a 12 inch round pipe will discharge 79 cubic feet of air per minute, when the air is travelling at a velocity of 100 feet per minute, which is the estimated velocity when the basement pipe has an elevation of 1 inch in 12 inches, but when the elevation is increased, the velocity is also increas-



ed, and as the elevation is increased at the first turn in the elbow, it is reasonable to suppose that the air is travelling at a velocity of at least 150 feet per minute when it passes through the bottom of the register, inasmuch as it is travelling at a velocity of 300 feet per minute through the perpendicular or wall pipe. Then if the warm air is travelling through the bottom of a number 15 register at a velocity of 150 feet per minute, this register will take care of 1 1-2 times as much air as a round pipe of equal area would supply. The actual area of the bottom opening of a No. 15 register is 84 square inches; this register, therefore, will take care of (at a velocity of 100 feet per minute) 84 times 100 feet (1,200 inches) or 100,800 cubic inches of air per minute, which when divided by 1,827 cubic inches in a cubic foot, gives us 58 1-2 cubic feet per minute, but when travelling at 150 feet per minute, which is the lowest velocity the air travels when passing through the bottom of these registers—other conditions being normal—they would take care of 1 1-2 times 58 1-2, or 87 3-4 cubic feet of air per minute, and the 12 inch pipe can supply 79 cubic feet.

By using one large basement pipe for heating two rooms, one on the first floor and one on the second, there is less loss of heat in the basement from friction and radiation, therefore cooler basements and warmer living rooms. The basement is not filled with warm air pipes as is the case with 1837 method.

A Builders' Exchange has been formed in Victoria, B.C., with Thomas Catteral as president and J. E. Smart as secretary-treasurer. Already the organization has an excellent start and a large number of the best builders are enrolled.

CEMENT AND CONCRETE

[NOTE.—Contributions suitable for publication in this Department are invited from subscribers and readers]

TINTING A CEMENT HOUSE.

It not infrequently happens that in building a concrete house, the cement will dry out in several colors or shades, and it is found desirable to tint the entire surface of a uniform color, that shall not be paint, but practically a part of the house itself. This result may be secured, says Edward Hurst Brown in an article on "Painting" in the American Carpenter and Builder, by washing the whole house with cement, but their is a trick in doing this properly that is not always understood. The cement wash is made by mixing two parts of Portland cement and one part of marble dust with enough water to reduce it to about the same consistency of whitewash, and is applied with a whitewash brush. The wall must be thoroughly wet with water for several hours before the wash is applied and kept constantly wet during the application, and for at least a day afterward. The important thing to remember is that the wash must not be applied to a dry wall, as it will not adhere. This work will be worth at least a dollar a square yard, or more, according to the price of labor, but the result will fully justify the cost.

CONSISTENCY OF MORTAR AND CONCRETE.

From available data on the consistency of mortar and concrete it may be gathered that a dry mixture is much stronger than a wet one up to the age of a few weeks, but that with the lapse of time the resistance of a wet mixture increases far more rapidly than that of a dry mixture.

Among other recent experimental investigations into this subject, that of Mr. Brabandt is one of the most useful. For the purpose of these tests a large number of prisms of cement, mortar, and concrete, mixed in different proportions, were made and left to harden for the period of twenty-eight days. The results, published in the "Zentreblatt der Bauwerke," appear to demonstrate that the proportion of water corresponding to maximum resistance is invariably between 13 per cent. and 30 per cent. of the collective weight of cement and sand in the mortar, that the proportion increases progressively with the increased quantity of cement used, and that the gravel added subsequently to make concrete has no influence on the proportion of water. It appears, further, that a small variation in the proportion of water may cause a considerable variation of resistance, particularly with mortars very rich in cement. In applying these and all other experimental results, it is, of course, necessary to bear in mind the essential difference between working conditions and those obtaining in the laboratory.

BOND BETWEEN CONCRETE AND STEEL.

As the result of a number of tests to determine the bond between concrete and steel made in the University of Illinois a university bulletin has been prepared by Professor N. A. Talbot, in which the following conclusions are presented:—

Little difference is found in the bond resistance per square inch of surface of bar in contact with the concrete, whether the bar is imbedded in six or twelve inches. Evidently a length may be found beyond which the stretch of the steel would cause uneven distribution of the bond stress along the length of the bar and cause failure to begin at the point of the greatest stress in the steel and thus give results not representative of the real bond resistance. This limitation applies to length for use in experimental tests of bond. In simple beams the bond stresses are applied along the length of the bar, and stretch and bond exist together. The richer mixture of concrete gives somewhat higher bond resistance than the leaner, the values for the 1:2:4 concrete averaging, say, 10 to 15 per cent. higher than the 1:3:5½ concrete. For plain round mild steel rods, the average for the bond resistance ranges from 350 to 450 pounds per square inch of contact surface.

The value of bond resistance will depend upon the smoothness of the surface of the bar, the uniformity of its diameter and section, the adhesive strength of the concrete, and the shrinkage grip developed in setting. The effect of smoothness of surface and uniformity of diameter and section is seen in tests made with cold rolled shafting and tool steel. The average bond developed with cold rolled shafting and tool steel was 147 pounds per square inch of contact surface, as compared with about 400 pounds for ordinary plain, round, mild steel rods. It should be stated that not only was there a very noticeable difference in the smoothness and finish of the surface of the rods, but the section of the cold rolled shafting and tool steel was very uniform, the diameter not varying more than 0.0001 or 0.0002 inch at one-quarter inch intervals throughout the length, while mild steel rods will vary as much as 0.0015 inch. It is to be expected that the smoothness and uniformity of section of drawn steel wire will operate to give low values of bond resistance, though, of course, as the section of wire is small compared with the circumference, the bond stresses developed when wire is used are relatively small. Attention is called to the fact that in the reinforced concrete beams tested at the University the bond stresses developed in beams failing by tension of the steel, diagonal tension of the concrete or other similar methods amounted to from 73 to 193 pounds per square inch. Even at the breaking load,

then, the bond stress developed in the mild steel rods was far below the bond resistance found in these tests.

In these tests the bars began to slip when the maximum load was reached. After slipping began, the resistance to motion was still considerable. The running friction, taken when the bar had moved about one-fourth inch, amounted to 54 to 72 per cent. of the bond developed in the case of mild steel bars and to 32 to 49 per cent. in the case of cold rolled shafting.

A CEMENT ICE HOUSE.

Double walls, which are such a requisite in an up-to-date ice house, can be easily made with cement. The appropriate mixture for such a house, says "Carpentry and Building," is one part cement to two parts clean sand and four parts of small broken stone. The excavation should be carried 5 feet below the surface and 16 inches should be allowed for the walls. A layer of broken stone, followed by one of coarse sand, well pounded down, should form the floor, and over this a good mixture of concrete should be spread.

The walls are formed by making boxes for every foot-section with boards. The walls should be 2 inches thick with a 10 inch space between. A layer of galvanized iron flat strips should bind the inner and outer wall together every other foot-section up. The ends of the bonds should be turned in to give greater strength. After each section has hardened the forms can be removed and used for the section above. If the bottom and top of the walls are filled in solid with cement the air space will have no outlet for the air to circulate. The roof is made of wood and should be slanting to shed the rain, the eaves projecting a foot beyond the walls. The roof should be double, like the walls.

In all ice house construction the cardinal principles of its purpose should be kept well in mind. The first consideration is that the ice must be protected from the outside air. If a current of outside air comes in contact with the ice it will quickly melt it, and any type of house which permits this will not answer the purpose. Another point that may be frequently overlooked is the need of perfect drainage. Some of the ice will melt, and as a consequence the water accumulates at the bottom. Ice standing in water will quickly melt no matter how well the inside is protected from outside air currents. The cement bottom of the ice house must, therefore, be able to carry away the moisture. If a cement bottom is used it must slope toward one side or in the middle, where a drain pipe is installed. Care must be taken in selecting the site to see that this drainage can be carried away. If the soil is thick it may be necessary to lay a soil pipe to conduct the water away from the foundations. Good drainage can be had in thick soil by digging a hole in the middle or corner of the foundations and sinking an old barrel. The barrel is then filled with loose stones and the drainage carried into this.

It is more important to have the bottom of the ice-house amply protected from outside air than the top. The ice in the bottom of the house must be used last, and for this reason it needs the most protection. It is possible to make an ice house too tight—that is, under the roof it may be so tight that there is no circulation of air. The result of this is that moisture collects inside and causes loss. The roof is simply to protect the house from rain and sun. Underneath it there should be good air ventilation. This will absorb the moisture and carry off foul air. Ventilation in the roof should be provided so that it can be increased or decreased to suit the conditions of the weather and ice. When the interior is damp it is a sign that there is not sufficient roof ventilation. Cool, dry air is the great consideration, and if this can be obtained the ice will keep indefinitely.

ELECTROLYSIS THE CAUSE OF IRON RUST.

The rusting of iron is not due to the direct attack of oxygen combined with water. The role of the oxygen is a secondary one, and the underlying cause of rusting and corrosion is an electro-chemical or electrolytic problem. Iron passes into solution as a ferrous iron by replacing hydrogen which is set free; oxygen then oxidizes the ferrous iron to the ferric condition with the formation of a hydrated oxide. All soluble inhibitors, such as alkaline solutions or chromic acid and its salts, act either by presenting the presence of hydrogen irons or by electro-chemically preventing their attack. A solution of ptassium bichromate no stronger than one six-hundredth normal will indefinitely prevent the rusting of polished specimens of metal in cold water, even if free access of air and carbonic acid is provided for. Under the same conditions at a boiling temperature no rusting or pitting occurs if the concentration of the bichromate is above two one-hundredths normal.—Allerton S. Cushman, in a paper read before the American Society for Testing Materials.

COLORS FOR HOUSE PAINTING.

The effect of a house may be improved or marred by the choice of the colors for painting it. There is no doubt that the old New England houses, with their white paint and green blinds, presented a very charming appearance, when seen amid the beautiful elms of the quiet village streets, and indeed a white house almost always looks well when surrounded by considerable foliage. On the other hand, a white house becomes very glaring, when it stands out in the open, with the bright sky as a background. This shows at once, says Edward Hurst Brown in an article on "Painting," in the American Carpenter and Builder, the necessity for making the colors harmonize or fit in with the surroundings, hence no general rule for color selection can be given. The idea that one color or one class of colors should be chosen because it is fashionable or the prevailing mode is for this reason rather an absurd one. In general, it may be said that dark colors should be selected only for a large house that stands out in the open, while lighter colors or tints should be chosen for houses that stand among trees or which are not over large. A house looks larger when painted in light colors than when dark colors are used. This is a point that should always be remembered, for most persons experience a keen feeling of disappointment if their house appears small, while if it can be made to look larger than it is they are more than satisfied.

—THE—

Canadian Architect and Builder

Monthly Journal of Modern Constructive Methods,

(With a Weekly Intermediate Edition—The CANADIAN CONTRACT RECORD).

PUBLISHED ON THE THIRD WEDNESDAY IN EACH MONTH IN THE INTEREST OF

ARCHITECTS, CIVIL AND SANITARY ENGINEERS, PLUMBERS DECORATORS, BUILDERS, CONTRACTORS, MANUFACTURERS OF AND DEALERS IN BUILDING MATERIALS AND APPLIANCES.

The C. H. MORTIMER PUBLISHING CO., Limited
Publishers,
Confederation Life Building, - TORONTO, CANADA.

Telephone Main, 2362.
Branch Offices:
Room B 34 BOARD OF TRADE BUILDING, MONTREAL.
Bell Telephone 2299.
720-721 UNION BANK BUILDING, WINNIPEG.
DAVIS CHAMBERS, HASTINGS STREET, VANCOUVER, B. C.

SUBSCRIPTIONS.

THE CANADIAN ARCHITECT AND BUILDER will be mailed to any address in Canada or the United States on the following terms: Architects' Edition, (including CONTRACT RECORD) $3.00 per year; (without CONTRACT RECORD) $2.00 per year. Regular Edition (including CONTRACT RECORD) $2.00 per year, (without CONTRACT RECORD) $1.00 per year. The price to foreign subscribers is: Architects' Edition, 16 shillings; Regular Edition, 12 shillings. Subscriptions are payable in advance. The Journal will be discontinued at expiration of term paid for, if so stipulated by the subscriber; but where no such understanding exists, will be continued until instructions to discontinue are received and all arrears of subscription paid.

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WILL MANUFACTURE CEMENT.

Several financial men of Toronto, it is said, have interested themselves in the Ben Allen Portland Cement Company, Limited, which will erect a large plant at Owen Sound or at Ben Allen, on the Grand Trunk Railway, four and a half miles from that town, where the marl and clay deposits are located. The company is capitalized at $500,000, of which $60,000 has been subscribed for in Owen Sound and vicinity. The company plans to erect mills with a capacity of 600 barrels daily, with a view to extending operations to 1,000 barrels per day later on. The cement business in the Owen Sound district is assuming large proportions. The companies now there include the Owen Sound Cement Company at Shallow Lake, the Sun, Grey and Bruce, and Imperial at Owen Sound, which have a combined capacity daily of nearly 3,000 barrels.

WORKMEN'S COMPENSATION.

Apropos of the legislation proposed by the Quebec Government respecting "Compensation to Workmen for Accidents," the following notes and suggestions have been submitted by Mr. J. H. Lauer, secretary of the Legislative Committee, Montreal:—

The proposal to assimilate our present laws as to "compensation," and to establish a systematic basis for estimating such compensation, in view of the widely diverging practice now in vogue, is one to be rather welcomed than opposed by employers; provided always that an honest effort be made to guarantee both employer and employe fair and just treatment. Our law now contains no rule to guide the court when it comes to consider the damage done. It is left entirely to the discretion and will of judge and jury; and judges and juries are apt to appreciate very differently the damage occasioned by accidents, according to their varying point of view or personal sympathies.

The jurisprudence of the Provincial courts has steadily tended towards the establishment of the principle of "professional risk," i.e., the employer is considered "technically" liable for any accident incurred in his employ. Thus as far back as 1886, one of the judges alludes to the steady tendency amongst Provincial judges to increase damages, and adds: "Philanthropists are never so charitable as when spending other people's money." On the other hand, the Supreme Court of Canada has, by the famous 1901 judgment, maintained the doctrine of "faute delictuelle," i.e., that a plaintiff in actions for damages must establish the employer's "fault" or "contributory negligence." In consequence of this decision, such actions are frequently taken for less than $2,000 to avoid the jurisdiction of the Supreme Court, and to confine the case entirely to the Quebec tribunals, which decline to follow the above decision.

The following table, compiled from actual statistics of accidents furnished by the experience of the great industrial countries of Europe (France, Belgium and Germany), will prove that less than 50 per cent. of risks are "professional," that is, inherent in the actual work or manufacture:—

19 per cent of accidents due to fault of the employer.
25 per cent. of accidents due to fault of the workmen.
44 per cent. of accidents due to "professional" risk (i.e., fortuitous event).
12 per cent. of accidents due to unknown cause or to a third party.

100 accidents.

The Imperial German report adds the significant remark:—"The employer cannot be held responsible (i.e., actually in fault) in 75 per cent. of accidents arising."

The new law proposed by the Hon. H. Archambault, the principle of which is still further endorsed by Hon. W. A. Weir and Mr. J. W. Stephens, M.L.A., establishes this very principle of "faute professionnelle" (i.e., the employer's technical" liability) as the law of this province for accidents. The following are the principal features in which the subjoined recommendations or amendments are urged:—

1. Procedure.—The new bill apparently still permits proceedings or appeals to be taken at common law under the Civil Code.

A. In this respect it may with reason be submitted, that while employers would welcome a measure which would mean simplified procedure, diminution of law costs, and a practical basis for estimating compensation which shall automatically correspond with the earning capacity of the victim, the relief would be purely illusory if they were still open to attack by way of the Civil Code. The new Act would simply remain a dead letter.

2. Fixed basis for compensation under this Act. Damages to be computed on 60 p.c. of the workman's average annual wages (or the wages current at the time for such class of work) up to an annual total of $500, adding one-fourth part of any wages in excess of $500. This is equivalent to the scale adopted by the leading European industrial countries, and forms a reasonable automatic basis for computing the weekly allowances for "temporary incapacity" through accident.

3. Definition and duration of "incapacity through accident." The new bill is too indefinite and assigns no time limit; a wide loophole would be created for a "life-long pension" thereby.

C. On the automatic basis created by Sec. 2 (above, we suggest:—

(a) "Temporary" total incapacity limited to 100 weeks' proportion of allowance;
(b) "Temporary" partial incapacity limited to 26 weeks, and one-half of compensation in the proportion named by Sec. 2.
(c) "Permanent" total incapacity to be defined as:—Loss of life; or of both hands, or of both feet, or both eyes; or of one hand and one foot; and to be entitled to the full capital sum specified in Sec. 4 (below): one-half of such capital sum to be awarded for loss of either one foot, one hand, or one eye. Further that a complete schedule of allowances for specific surgical operations be embodied in the bill, based upon the proportions of capital sum as fixed by the scale adopted by chartered Canadian accident insurance companies.

4. The proposal to entitle all relatives of victims in case of death to a life annuity based upon the earning capacity of 60 per cent. as given in Sec. 2 by the Act is unjust to the employer in the case of young victims, and to the employe in the case of elder victims.

D. We suggest that the law just adopted by the Imperial Parliament, and effective since 1st July, 1907, be taken as the basis of the capital sum; namely, the equivalent of three years' average wages at time of accident. Where the compensation is thus automatically fixed by law, all appeals and expensive legislation should be excluded.

Finally, as decided by the Imperial Act just quoted, our employers should insist that the new "Compensation" Act shall apply to all classes of the community who work for wages (including agricultural and domestic help) and not merely to "industrial" employes.

It stands to reason that an Act such as this will entail compulsory accident insurance, besides largely increasing the rates of premium. This addittional cost will necessarily be added by contractors and manufacturers to their building and factory costs, and in the end falls upon the public, in other wards mainly upon these very workmen who will foot the bill in the shape of increased cost of rent, clothing and utensils. Economic laws, like water, find their own level at last.

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Moreover, manufacturing plants are usually of large area and permanent in construction. Both first cost and maintenance cost are important considerations in deciding the kind of roof to be used, and experience has demonstrated that a Barrett Specification Roof *costs less than any other kind* owing to its remarkable durabilty.

For skyscrapers—expensive structures that could afford whatever kind of roof is most desirable —Barrett Specification Roofs are likewise universally adopted. That is because such roofs require no care, and conform to the requisite standards of fireproof construction, taking the base rate of insurance.

Modern reinforced concrete structures where fireproof material is required are best covered with Barrett Specification Roofs. The great new Ketterlinus Building, the first reinforced concrete skyscraper in Philadelphia, illustrated herewith, is a typical instance.

The best practice of the day is making use of Barrett Specification Roofs for all large buildings and manufacturiug plants as standard as Portland Cement.

We shall be pleased to send a Booklet covering the subject in detail.

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CONCRETE BUILDING CODE.

What is regarded as one of the most complete concrete building codes in existence has recently been completed in Cleveland, Ohio. Its originators claim for it all the best features of existing codes, with many additional ones added which the exigencies of the times and modes of construction have demanded.

Concrete buildings are limited, in the first place, to six storeys, or eighty feet, in height. This limit is to be maintained until the fact has been demonstrated, by several years' lapse of time, that concrete is all that it is claimed to be. When the total amount of concrete to be used exceeds seventy-five cubic yards the mixing must be done with machinery, thus insuring a better grade than if mixed by day laborers.

The code provides that complete and detailed drawings and specifications must be presented to the building inspector before a permit for construction is issued. All concrete walls above the basement level and all concrete floors and fireproofing within a building must be made of standard brands of Portland cement, sand and either of the following inerts: Silica gravel, broken stone, slag, brick, terra cotta or boiler cinders, thoroughly screened. No particle shall exceed two inches in size.

Artificial stone made of Portland cement and fire and waterproof material may be used as a substitute for any natural stone. No artificial stone, however, containing more than 15 per cent. of lime or crushed limestone, can be used as a lintel or bearing part of any building over five storeys in height.

Portland cement building blocks, with hollow spaces not exceeding one-third the area of the block and not exceeding nine inches high or eight inches on the beds, may be substituted for brick in all buildings.

Trussed concrete construction requires that the work be properly reinforced by the use of armored concrete in which the concrete mixture shall be of such resistance to crushing not less than 2,000 pounds per square inch after hardening twenty-eight days. It must also be of such proportions that the cement shall exceed by at least 10 per cent. in volume the voids in the aggregate. The steel reinforcement must be of such a shape and so combined with the concrete that the steel may be made to assist in the resistance to compression, take up the tensile stresses and assist in the resistance to shear along proper structural lines.

Columns composed of structural steel shapes or bars, latticed together by riveting and filled in solidly and surrounded by concrete, may be proportioned by assuming that the concrete enclosed within the outer flanges or faces takes up a proportioned part of the superimposed load within its limit of stress, provided that the total assumed load on the concrete and steel column combined does not exceed a factor of three if assumed to be carried on the unfilled column when standing free.

According to the code all concrete work must be constructed along proper structural lines. When each panel of armored or reinforced concrete or any trussed concrete member is started it shall be finished in its entirety before shutting down for moorings or for the

day's work, or for any other purpose longer than thirty minutes. Unsafe or unfinished panels must be removed before starting new ones.

All centering must be self-supporting and provisions are made that centering shall not be removed for from ten to twenty days, according to the season of the year.

All structural concrete exposed to or worked in the outer air shall not be worked when the temperature is 32 degrees F. or less. Any concrete liable to be exposed to frost or snow before it has attained its permanent set must be temporarily protected. Centers on such work cannot be removed until the season is advanced beyond the probability of a frost.

Provisions are made for elaborate tests of all concrete work, specimens being submitted with reports to the building department for permanent file.

In the use of concrete footings provision is made that the bed shall not be less than twelve inches thick per course. Permission is given for the use of armored or reinforced concrete for footings when deemed necessary.

The code provides that the cement to be used in all building construction must be of the standard

Portland variety, either domestic or foreign, which, when tested neat, after one day test in air, shall be capable of sustaining without rupture a tensile strain of at least 200 pounds, and after one day in air and six days in water be capable of sustaining without rupture a tensile strain of 500 pounds per square inch.

The proportions of cement, sand, broken stone or macadam for concrete used in footings or foundations must consist of one part of cement to not more than three parts of sand and not more than five parts of macadam or broken stone. The cement and sand must be mixed thoroughly dry so that the mass shall be of uniform color, and then mixed with water until it becomes a plastic mortar. This mortar is to be mixed with the stone in such a manner that the mortar and macadam shall be a uniform mass. Dry sand and cement may be mixed with wet inerts, mixed thoroughly, and then water added and mixed thoroughly again.

In Cleveland all public and semi-public buildings must be fireproofed and every building in the main part of the city must be fireproof. In a few years, as the old structures decay and are torn down and replaced, the entire city will become practically fireproof. All buildings must have a five-foot space on each side of them if used for public entertainments. The restrictions regarding the building of theatres are very great.

A by-law to amend the present building inspection by-law is being introduced by the Victoria, B.C., City Council. The by-law seeks to remedy some defects in the system of issuing building permits, which, it provides, must be taken out for all building projected within the city limits. This will enable an accurate estimate of the amount of building going on to be made from time to time. It will also enable the building inspector to watch closely all buildings in course of erection and to see that the law is strictly observed.

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An expert says that concrete is perfectly tamped when the stroke of the tamper produces the same result as putting a quiver on the surface of a mold of jelly just released from the tumbler; that is, when it quivers so as to indicate a semi-liquid condition. When too much water is present such a consistency can not be obtained.

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